# MONTHLY WEATHER REVIEW.

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## INTRODUCTION.

This REVIEW contains a general summary of the meteorological conditions which prevailed over the United States and Canada during October, 1884, based upon the reports from the regular and volunteer observers of the Signal Service and from co-operating state weather services.

Descriptions of the storms which occurred over the north Atlantic ocean during the month, are also given, and their approximate paths shown on chart i.

The principal feature of the month was the number of areas of low pressures that occurred, with the average track high to the north, over the lakes and down the Saint Lawrence valley. The average number of barometric depressions and their average velocity per hour were in excess.

The temperature was decidedly above the mean, which is shown by the chart of departures from the normal.

The long and severe drought has continued in some of the southern states, with the absence, or only traces, of rain in some localities.

The atmospheric pressure was above the normal in the eastern and central portions of the country. The line of normal pressure runs nearly parallel to the forty-fifth degree of north latitude.

The severest storms of the month occurred during the 5th; 7th, and 8th; on the 13th; 20th and 21st; 23d, 24th, and 25th.

The principal cold waves were: from the 6th to 10th, crossing the country from Montana to Florida; that from the 13th to 16th, in the eastern sections; also that from the 19th to 24th, which moved first south and then east over the country east of the Rocky mountains.

The excessive rainfall in the lower Rio Grande valley was also a distinguishing feature of the month.

No tropical storm reached the United States during the month. Under "north Atlantic storms" are described, as numbers 5 and 5*a*, two tropical cyclones, which prevailed in the vicinity of Cuba.

In the preparation of this REVIEW the following data, received up to November 20th, 1884, have been used, viz.: the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and twenty-nine Signal Service stations and fourteen Canadian stations, as telegraphed to this office; one hundred and fifth-nine monthly journals; one hundred and fifty-seven monthly means from the former, and fourteen monthly means from the latter; two hundred and fifty-eight monthly registers from voluntary observers; forty-three monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports, through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs, furnished by the publishers of "The New York Maritime Register;" monthly weather reports from the local weather services of Alabama, Indiana, Louisiana, Missouri, Nebraska, Ohio, and Tennessee, and of the Central Pacific Railway Company; trustworthy newspaper extracts; and special reports.

## ATMOSPHERIC PRESSURE.

[*Expressed in inches and hundredths.*]

The mean atmospheric pressure for October, 1884, determined from the tri-daily telegraphic observations of the Signal Service, is exhibited by the isobarometric lines on chart ii. The mean pressure for the month is greatest between the parallels of 33° and 40° north latitude, east of the Mississippi river, this region being inclosed by an isobar of 30.15. The highest barometric mean for the month, 30.19, is reported from Knoxville, Tennessee, and Charlotte, North Carolina. To the northward of the area of greatest pressure, the barometric means decrease to slightly below 30.05, in the lake region and lower Saint Lawrence valley; and to slightly below 30.0 in the extreme northwest and Canadian Maritime Provinces. Along the Gulf coast the barometric means vary from 30.07 to 30.12; at Key West, Florida, the monthly mean is 29.98. The isobar of 30.1 includes nearly the whole of the country lying between the parallels of 30° and 38° north latitude, east of the one-hundredth meridian. From the western portions of Kansas and Nebraska northwestward to the north Pacific coast the monthly barometric means are slightly above 30.05. The area of least mean pressure, inclosed by the isobar of 29.95, includes the southern portions of Arizona and California, the mean pressures varying from 29.94 at Forts Apache, Grant, and Thomas, Arizona, to 29.96 at San [illegible]go, California. Along the Pacific coast, north of Los Angeles, the mean pressure varies but slightly from 30.0.

Compared with the preceding month the mean pressure is higher in all districts, except southern Florida and Nova Scotia, where there is a slight decrease. The increase is greatest over the eastern Rocky mountain slope, where it varies from .18 to .22; in the western plateau districts, the lake region and central valleys, the increase is from .08 to .17; and along the Atlantic and Pacific coast from .02 to .08.

Compared with the normal pressure for October (see chart iv.), deficiencies varying from .01 to .05 are shown along the northern border of the country from northeastern Montana to New England. There is also a slight deficiency in California and in southern Florida. In all other portions of the country the mean pressure is above the normal, the departures being greatest over northern Texas, and portions of Arkansas, Indian Territory, and Louisiana, where they vary from .10 to .13. On chart iv. the line inclosing the region over which the departures exceed .05, is drawn from southern New Mexico northward to eastern Wyoming, thence southeastward in an irregular course to the south Atlantic coast, and thence southwestward to the lower Rio Grande valley.

### BAROMETRIC RANGES.

The monthly barometric ranges are greatest in the upper lake region, extreme northwest, northern and middle plateau districts, and on the north Pacific coast, where they are from 1.00 to 1.12; they are least in southern Florida, and on the

coast of Texas, where they are from .32 to .40. In the table of "Miscellaneous meteorological data" published elsewhere in the REVIEW, will be found the monthly ranges as reported from the several stations of the Signal Service.

### AREAS OF HIGH BAROMETER.

In this chapter, devoted to the discussion of high barometric anti-cyclonic areas, only those are considered that have had a distinct movement in contra-distinction to the permanent or relative high areas, and in locating the centre, consideration is taken of the departure from the normal as determined for October. A feature that appears to show itself is that the area of greatest departure is generally found to be nearly concentric with the high areas as drawn from the readings reduced to sea level, being but a little in advance of them. The imperfection of the monthly constants now used, when extreme high or low readings are considered with temperatures differing considerably from the normal, often becomes apparent when locating the exact centres of barometric areas. The chart accompanying this REVIEW is approximate, and is interesting in studying the cold waves, "northers," and many northeasterly gales on the Atlantic coast. During the month eight such areas have occurred, whose departures have equalled or exceeded .20 inch.

I.—On the morning of the 1st this area rested over the upper lake region with a departure from the normal of .3 inch. Its movement was easterly, and in advancing, it increased in intensity. It followed low area number i. and was succeeded by low area number ii. A cool wave accompanied the area, causing precipitation in the lake regions on the 1st. During the 2d the low temperatures were felt from the Saint Lawrence valley to Virginia, and rain fell from the middle Atlantic states to the upper lakes. Northeasterly gales occurred on the 2d along the Atlantic coast south to the Delaware capes. On the 3d it passed off Nova Scotia, the southern edge having parted from the main area and, resting over the middle Atlantic coast during the 3d, 4th, and 5th, it slowly moved into the south Atlantic and Gulf states as an area only slightly above the normal. On the morning of the 3d the winds on the Atlantic coast had shifted to southerly, and fine weather and normal temperatures prevailed over the Atlantic and Gulf states.

II.—This area appeared on the 6th in Washington Territory, and by the morning of the 7th appeared central in Dakota. It lent its influence in developing low area number v. on the 7th. It was preceded by a cold wave which, on the night of the 7–8th, was accompanied by frosts from Kansas to Minnesota. The cold wave with this area was the most severe of the season. It first appeared in the northwest on the afternoon of the 6th and spread rapidly to the southeast. Within twenty-four hours the fall in temperature from Minnesota to Colorado was from 20 to 30 degrees, and during the next twenty-four hours the cold wave extended from Lake Erie to Texas. By the morning of the 9th the wave covered a belt of territory from the Saint Lawrence valley to the Mexican boundary, and frosts were reported in the lake regions, Ohio valley, and northwest. A severe "norther" was felt in Texas. By the morning of the 10th the cold wave had covered the states southeast of a line extending from the mouth of the Saint Lawrence southwest to Texas. Frosts occurred in the states north of Tennessee and North Carolina. The cold wave ceased during the 11th in the south Atlantic states. The area of high, after passing east of the Mississippi valley, diminished, and after remaining central over the middle Atlantic states, disappeared on the 12th off Cape Hatteras. With the advance of the cold wave rains occurred in the northern states, but no rain fell in the southern states and the long continued drought in those districts, which promised to break up, continued. Cold wave signals were announced in advance of the wave in Iowa, Kansas, Missouri, Illinois, and Wisconsin on the 7th, and frost warnings were distributed in northern Missouri and Wisconsin on the same date. On the 8th the cold wave was announced in Arkansas, Indiana, Michigan, Ohio, Kentucky, and Tennessee. On the 9th warnings for cold wave and frosts were sent to the New England states, the middle states, and continued in the states north of Tennessee. The chart which accompanies this REVIEW shows the southern limit of frost.

III.—This area originated in Colorado early on the 12th, moving to the northeast, and by midnight was central in Dakota. During the 13th it prevailed in the upper lake region, lowering the temperature slightly in the northern districts, where it increased in intensity. During the 14th, 15th, and 16th it moved into Alabama where it diminished and merged into high area number iv. then approaching from Wyoming. The temperatures were lowered in all the states to the east of its central path. During the 14th and 15th northeasterly gales were experienced along the Atlantic coast severe enough to run the schooner "Sarah Shubert" ashore on Hog Island, near Norfolk. Heavy frosts occurred in the lower lake region, Ohio valley, and middle Atlantic states on the morning of the 15th, and on the morning of the 15th were reported in the states of Tennessee, Virginia, and North Carolina and on the 17th in Alabama. Fine weather prevailed during the dates of its southerly movement, and, except in the New England and middle Atlantic states, remarkably fine weather prevailed during the presence of this high area and that into which it merged, number v., lasting until after the 21st, when the storm, number x., interrupted the drought slightly. With the approach of the cold wave wild geese and ducks were seen migrating southward at several stations in North Carolina and Virginia. Warning by cold-wave signals, the Farmers' Bulletin, and special messages to railroad companies who co-operate in distributing frost announcements, were sent on the 13th and 14th into the states of Wisconsin, northern Illinois, Michigan, Indiana, Ohio, Pennsylvania, New York, and into New England, and later on the 14th into the states of Delaware, Maryland, and Virginia.

IV.—The first appearance of high area number iv. was on the morning of the 14th in Washington Territory. It moved slowly southeast and was present in Wyoming on the morning of the 15th. Upon crossing the Rocky mountains it increased in intensity, and from the 15th it appears as a large region of high barometer, extending from Wyoming to Florida, having merged with high area number iii. on the Gulf coast. On the 18th it was central in Texas, and during this date it overspread the central valleys, and at midnight of the 18th was central in Pennsylvania. It hovered on the middle Atlantic coast until the 22d, when it was broken up in North Carolina. It was characterized by no decided cold wave but by dry and fine weather. The temperature was gradually lowered in the eastern sections and light frosts occurred.

V.—The study of this area, in connection with the circumstances accompanying it, is quite interesting. It was preceded by a zone of low pressure on the 19th which extended from Lake Superior southwesterly to Colorado; it followed low area number ix., and late on the 19th it recurved and merged into high area number vi., and subsequently assisted in developing low area number x. On the morning of the 19th there was scarcely any indication that the phenomena that so soon after occurred were so near at hand. At the afternoon report the high pressure was in the Northwest Territory. Low area number ix. was near Lake Superior, and strong northerly winds were reported in the extreme northwest, and a fall in temperature from ten to forty degrees in Dakota, Montana and the Northwest Territory. By midnight the high was central near Fort Buford, and a blizzard had overspread the Rocky mountain slopes to Nebraska and Colorado. The departure from the normal barometer increased and the high area centre moved eastward behind the low area that was moving rapidly eastward. During the 20th it overlaid Dakota and Minnesota, and the cold wave, which was very severe, had reached Michigan, Missouri and northern Texas. During the 21st it took a southerly movement and soon recurved to the westward and merged into high area number vi, then central in Montana. The rapid advance of the cold wave was stopped, and during the afternoon and midnight of the 21st it extended from Michigan to the Texas Panhandle, and

was most severe in Iowa and Missouri. Its further description is continued in high area number vi. As early as the afternoon of the 19th announcements were made by hoisting cold wave signals in the cities of Leavenworth, Kansas City, Des Moines, Burlington and Chicago, and preliminary warnings were sent to the cities of St. Louis, Springfield, Illinois, Little Rock, Indianapolis, Detroit and Columbus. At the midnight report of the 19th announcements were made general in the states west of the Mississippi and north of the Ohio rivers. The advance of the cold wave was marked by rain, and the long drought in northern Georgia was slightly interrupted on the 22d by the first rain that had fallen, sufficient to lay the dust, for seventy-three days. In advance of the cold wave wild geese were observed in South Carolina flying south. The fall in temperature at Birmingham, Alabama, was 52° in thirty-two hours. The different railroads in Texas and the southwest were informed by telegraph of the approach of the "norther." On the morning of the 20th the cold wave announcements were sent to New England and the middle states.

VI.—This area was, during the 20th, central over Washington Territory. During the 21st it moved from the Columbia valley eastward to northern Montana, and after the afternoon of this date was merged into high area number v., then central in western Nebraska. At midnight the barometer was highest in Montana, but it was high as far south as Texas. On the morning of the 22d nearly the same conditions continued as at midnight previous, and heavy frosts were reported in the upper Mississippi and Missouri valleys. During the remainder of the 22d this area moved rapidly southeastward into the Missouri valley. In the meantime the cold wave in Missouri and Iowa on the afternoon of the 21st, noticed in the description of high area number v., had become less severe, but with the advance of high area number vi. it was strengthened and moved rapidly south and southeasterly, its front at midnight of the 22d being along the Appalachian range of mountains and south to Louisiana. At the same time a "norther" in Texas had reached the Gulf coast. On the morning of the 23d frosts were reported in Alabama, Tennessee, Texas, and the upper Mississippi and Ohio valleys. On the 23d the centre of this high area moved down the Mississippi valley and advanced the cold wave to the Atlantic and Gulf states, northerly gales resulting along the Atlantic and Gulf coasts, being so severe in the Gulf of Mexico that they were reported as hurricanes, some miles from shore. On the morning of the 24th severe frosts were general north of latitude 33°. During the 24th the high area overspread the southern states and the temperatures reached their minimum, the cold wave moving into the Atlantic ocean. On the morning of the 25th severe frosts were reported from Georgia northward to Maryland. Ice was also observed in northern Georgia. No frosts occurred in Florida, though the temperature was lower than during any October within the least three years. During the first part of the 25th the high remained central in South Carolina, and at midnight merged into high area number vii., then central in the lower lake region. Before the advent of the conditions that began on the 20th in the northwest the weather throughout the United States had been remarkably dry and clear for over a week, but on the morning of that date was shown a wave of cold, stormy weather moving in a line to the southeast, its advance line extending from the Strait of Mackinac to Colorado. The next morning it was parallel to that of the morning previous and extended from Lake Ontario to central Texas. On the morning of the 22d it included the lower lake region and the Ohio valley, and was still parallel to its first position. During the 22d it reached the Atlantic and Gulf coasts, causing the first rains that had fallen in the southern states and Virginia for nearly two months; the rain, however, was not heavy enough to allay the long continued drought in those sections. The cold wave announcements of the 19th and 20th in connection with high area number v. were made long in advance and were verified. On the morning of the 23d frost warnings were sent to North and South Carolina, Kentucky, and Tennessee, and on the 24th to the northern portions of Georgia and Alabama. The warnings sent for Mississippi and Louisiana at this time were verified only in northern portions of those states, while the warnings for the fruit districts in northern Florida were not verified, though the temperature, as before stated, was remarkably low. The chart showing the frost limit of this date shows how near to the extreme south the approach was.

VII.—This area extended from Manitoba down to the Missouri valley on the afternoon of the 24th, but was central in Manitoba. By midnight of this date it had pushed forward to the upper Mississippi valley and was central in Minnesota. During the 25th it merged into number vi. in the Southern states, and a very large high barometric area overlaid the states from the Mississippi valley to New England and south to Cuba, with its centre in the lake regions. This area was characterized by the greatest departures occurring during the month, the readings being unusually high in the Northern states. At the close of the 26th this area had moved into the Atlantic states, being central off New England, but extending from Newfoundland to Florida. During the 27th the area of high continued to skirt the Atlantic coast states, and the centre had advanced northeasterly off Nova Scotia. High area number vi. preceded this area so closely and reduced the temperatures so that number vii. was not characterized by a cold wave, although the temperatures were further reduced. On the morning of the 26th frosts were reported from Virginia to New York. This area was followed by low area number xi., and general rains fell from the Gulf to Canada as it moved eastward. During the northwest gales which occurred, Lake Superior was made dangerous, and on the 24th the steamer "Scotia" went ashore on Keewenaw point. A severe snow storm occurred with the gales. The steam barge "Farwell" was compelled to return to Marquette on account of heavy sea on the 22d. Great numbers of wild geese were observed at the upper lake stations flying southward in advance of the cold weather attending this "high." The first ice of the season was observed at several of the northern stations.

VIII.—On the 25th, following low area number xii., this high area appeared in Washington Territory. It increased rapidly and continued central at midnight over that territory. During the 26th it remained constant in intensity and crossed the Rocky mountains. During the 26th the steep gradients between it and the low which was in front resulted in high northerly winds throughout this section. A cold wave was caused, which, by midnight, extended from Lake Superior to Colorado. During the 27th the high barometric centre moved from Wyoming to the Arkansas river valley. The temperatures were lowered with its advance and rain fell from Canada to the Gulf, but the decided lowering in the temperatures was not advanced south of the Arkansas and Ohio valleys. High northerly winds occurred on the Texas coast. On the morning of the 28th frosts occurred in Arkansas and northern and western Texas. After midnight of the 27th and during the 28th this area moved northeastward, and at the close of the day was central over Lake Ontario. The temperatures were reduced with its advance in the lake regions and Ohio valley and at midnight the middle and New England states felt the influence of the cold wave. During the 29th it moved slowly down the Saint Lawrence river and into the Saint Lawrence gulf where it continued. High northeasterly gales occurred on the Atlantic coast in advance and accompanying this "high." Gales were quite severe on the north Atlantic coast during its passage.

### AREAS OF LOW BAROMETER.

On the chart showing tracks of centers of low barometer areas, fourteen are noted. The paths of those depressions are almost uniform, originating in the northwest or in the lake regions, passing eastward over the lakes and thence north of east over Canada and down the Saint Lawrence valley. The energy developed in the centers described under numbers iii., v., viii., x. and xi. was most severe. An absence of any paths

of tropical cyclones is shown, none reaching sufficiently far westward, a thing very rarely happening during months of October.

The following table gives the latitude and longitude in which each area was first and last observed, and the average hourly velocity, for October, 1884:

| Areas of low barometer. | First observed. | | Last observed. | | Average velocity in miles per hour. |
|---|---|---|---|---|---|
| | Lat. N. | Long. W. | Lat. N. | Long. W. | |
| | ° | ° | ° | ° | |
| No. I | 49 | 68 | 48 | 59 | 25.0 |
| II | 44 | 109 | 46 | 59 | 29.5 |
| III | 51 / 39 | 111 / 104 | 45 | 59 | 52.5 |
| IV | 50 | 100 | 44 | 93 | 33.1 |
| V | 41 | 89 | 49 | 61 | 46.9 |
| VI | 46 | 122 | 47 | 62 | 38.1 |
| VII | 48 | 128 | 48 | 58 | 25.6 |
| VIII | 44 | 70 | 46 | 61 | 31.9 |
| IX | 51 | 102 | 47 | 56 | 35.9 |
| X | 43 | 91 | 45 | 63 | 22.5 |
| XI | 49 | 98 | 46 | 70 | 35.0 |
| XII | 49 | 111 | 48 | 60 | 27.1 |
| XIII | 49 | 110 | 45 | 81 | 29.8 |
| XIV | 49 | 126 | 42 | 97 | 49.4 |
| Mean hourly velocity | | | | | 34.4 |

The following table gives the number of low pressure areas during the month of October since 1873, with the average rate of movement since 1876:

| Year. | Number. | Hourly velocity. | Year. | Number. | Hourly velocity. |
|---|---|---|---|---|---|
| 1873 | 13 | | 1879 | 9 | 30.8 |
| 1874 | 9 | | 1880 | 12 | 22.3 |
| 1875 | 10 | | 1881 | 6 | 43.5 |
| 1876 | 9 | 27.7 | 1882 | 13 | 27.7 |
| 1877 | 11 | 20.2 | 1883 | 9 | 37.3 |
| 1878 | 13 | 19.6 | 1884 | 14 | 34.4 |

The average number of storm-centres during the month of October is 10.7. The average hourly velocity of low centres for October is 29.3 miles.

I.—This is a continuation of cyclonic area number xvi., described in the REVIEW for September. Its course was eastward into the Gulf of Saint Lawrence and disappeared after midnight of the 1st; gales accompanied it in the Canadian Maritime Provinces and in the Bay of Fundy.

II.—On the morning chart of the 1st the pressure was considerably below the normal throughout the Rocky mountain region, and a distinct centre could be located in western Wyoming on the afternoon chart, with the barometer half an inch below the normal. In its advance was a rain area extending from Nebraska to Pennsylvania. By midnight a trough of low pressure existed from British America to Arizona, but the centre of storm action was in eastern Wyoming with a tendency to storm formation over Colorado. Steep gradients appeared between Deadwood and Lake Superior, with increasing southerly winds in advance and increased temperatures in the Missouri valley. By the morning of the 2d the centre was over Dakota, but with the low area extending to the southwest. These conditions continued till the morning of the 3d, at which time the centre had only advanced to central Minnesota. The advance of this depression now became rapid and soon passed beyond our boundary, the edge only being apparent at our northern lake and Canadian stations, and by the morning of the 4th was central over the Saquenay river. Brisk winds were felt over Lakes Superior and Huron in its progress. During the 4th the centre curved southeastward and by the morning of the 5th passed east of Sidney. Cautionary signals were ordered on Lakes Michigan and Superior on the 1st in the afternoon. The northeast gale commenced at Duluth soon after hoisting signal, with rain, the velocity of wind reaching forty-six miles. The storm continued at this point until the 3d when the signal was lowered, and the wind backed to westerly. During the gale the flag-staff was carried away and damage was done to several instruments. On the morning of the 2d signals were extended to include Lake Huron, and in the afternoon were extended to include Lakes Erie and Ontario and the Atlantic coast from the Virginia capes to Block Island. At Marquette an east wind and rain storm occurred, commencing early in the morning. At Mackinaw City a brisk easterly gale with heavy rain commenced early in the morning of the 2d. On the 3d the wind shifted to southwest and continued as a gale. During the storm, instruments were damaged. At Escanaba, on the 1st, heavy rain began at night, with brisk northeast winds. On the 2d heavy and light rain fell occasionally, with winds generally easterly. Winds became southerly during the 3d. During this storm the wind reached a velocity of but twenty-three miles, which did not give an official verification of the signal. However, during the storm the propellor "Hurlbut" and schooners "Senator" and "Annie Vough" were damaged in the northern part of Lake Michigan, where ship captains report the hurricane during the 2d the worst of the year. At Alpena, Michigan, the easterly wind and rain storm began early in the morning of the 2d, and reached a velocity of thirty-five miles an hour. During this date the schooner "L. P. Ely" sprung a leak and the schooner "Quayle" was damaged; both schooners while being towed into harbor broke loose from tow. Dense fogs were reported over the lakes during the 2d. All signals on the west shore of Lake Michigan were justified except at Milwaukee. Rain began at night of the 1st. On the east side of Lake Michigan alternately light and heavy rains began late at night on the 1st, with brisk easterly winds. During the 2d a heavy sea was reported with occasionally heavy rain, clearing at close of day with wind veering to south. During the 2d brisk southerly winds and clear weather prevailed. Heavy thunder storms were reported on the 4th in southern Michigan and over Lake Erie, with high temperatures on the 3d, preceded by fog during the night of 2d. The wind was fresh to brisk from the southwest. On Lake Erie during the display of signals, except in the western portion where there were thunder-storms, the weather was clear and pleasant with fresh southwesterly winds. On Lake Ontario the signals could have been continued into the 4th, when thunder storms occurred.

III.—The chart shows that this storm-track originated in the uniting of two areas of low barometer. The greatest depression was observed in the Northwest Territory, and simultaneously a lesser depression in Colorado on the afternoon of the 4th, the departures from the normal in Colorado being but slight. By midnight, the Colorado depression had moved into southeastern Dakota, while that in the northwest remained nearly stationary. By the morning of the 5th, these two depressions had coalesced in a decided depression in northwestern Minnesota, with a departure from the normal of .70 inch. The movement of this area was now to the northeast, and its centre could no longer be distinctly traced, but it was evidently near the northern shore of Lake Superior. Its centre cannot be well defined until it reaches the Ottawa river, on the afternoon of the 6th. From its development in Minnesota to the 6th, gales prevailed on the lakes, and a cold wave followed in its rear. A very severe northeast storm occurred at Duluth in the early morning of the 5th, lasting till 9 o'clock, when it shifted to the southwest, and again increased to a gale. During this storm, the schooner "John Martin" was blown ashore on Park Point. On the afternoon of the 5th, a depression was observable in the Gulf of Saint Lawrence, and from this time until midnight, it passed rapidly to the east of Sidney, C. B., where a decided depression prevailed. Signals were ordered on Lake Superior, the west shore of Lake Michigan, and at the Strait of Mackinac on the morning of the 5th. At Marquette the storm commenced in the forenoon, from the southeast, with light rain. At Escanaba, on the forenoon of the 5th, the rain fell in torrents, being remarked by the observer the heaviest ever witnessed by himself and the oldest inhabitants; wind southeasterly. The sea was reported very high and dangerous in Little Bay de Noquet. Telegraph lines were prostrated. In the southern portion of Lake Michigan, brisk and high

southwest and south winds prevailed with light rain; severe thunder-storms also occurred. On Lake Huron the winds were southerly, but only fresh; thunder-storms were frequent.

IV.—The fourth depression was noticed on the morning of the 6th, in Montana. It moved southeasterly, and disappeared at midnight at the head waters of the Mississippi river. The departure from the normal pressure was but slight. It was accompanied by no decided meteorological features. It might be worthy of note that low area number v. developed twenty-four hours after number iv. had disappeared, and a little to the southeastward of the point of disappearance.

V.—This depression might properly be studied in connection with number iv., for from the disappearance of the one and development of the latter there was an area of low pressure overlying the states from Michigan to Missouri. The first cyclonic direction taken by the wind was over the state of Illinois on the afternoon of the 7th. During the remaining part of the 7th the development increased, and by midnight a distinct cyclonic area could be traced overlying the districts included between the states of Illinois and Michigan. The development and northeasterly movement during the 8th was rapid and by midnight it had reached northern Maine and the mouth of the Saint Lawrence river. This depression was preceded by decidedly heavy rains, causing wash-outs in Illinois and Iowa, near the place of development, which was apparently assisted by the movement of a high area and cold wave from the northwest, which is described in connection with the "high" of this date. Gales were prevalent on the lakes and were sudden and unannounced by signals, and many vessels were damaged. At Chicago heavy rain and a gale occurred. At Milwaukee the storm commenced at 10.30 p. m., suddenly backing from se. to n. and blew with the force of a heavy gale, accompanied by heavy rain; It continued for twelve hours. At Racine, Wisconsin, the damage was considerable. At Grand Haven, Michigan, the wind backed to ne. at 1.25 a. m., and blew from that quarter for ten hours. The wind and sea were very severe on the east shore. Several vessels were turned back to this harbor. In the northern portion of Lake Michigan northwesterly gales occurred during the day, causing rough and dangerous seas. On the morning of the 8th signals were ordered from the Strait of Mackinac to Cleveland, Ohio, and were changed to northwest signals in the afternoon and were also ordered for Lake Ontario. The signals on Lake Huron were lowered on the morning of the 9th and those at the other lower lake stations during the forenoon. On Lake Huron the northwest gale was very severe; many vessels sought shelter of the harbors. On the western end of Lake Erie a gale occurred on the morning of the 8th and is noted by the observer at Toledo as a brisk thunder-storm passing over the station from west to east with much lightning and heavy rain. The wind was southerly and veered, at about 9 a. m., to northwest and increased in force and continuing during the day till 2 p. m., then veering to northerly and diminishing. The severe squall or gust which swept over the western end of Lake Erie on the morning of the 8th is characteristic of the dangerous storms which are invariably felt on the approach of high areas from the west. The observer at Cleveland reports that during this heavy rain and thunder storm, which began at 6.30 a. m. the yacht "Sappho" went ashore and proved a total loss, and the "Constitution" lost her sails, while other damage was sustained. At Sandusky, Ohio, the gale commenced during the morning and ended just before 10 o'clock at night, with numerous disasters on Lake Erie, the observer reporting this gale as commencing with heavy rain and afterward turning into a northerly gale of considerable severity. The vessel "Maggie," of Lakeside, had her fore-mast carried away and was swamped, the crew were rescued by the Life-Saving Service. The scow "W. O. Keys" and schooner "Bertha Crowell" went ashore near Marblehead and went to pieces. The tug "Charles Henry" had her rudder injured. At Erie the northwest gale commenced at 11.50 a. m. and ended before 4 p. m. At Buffalo the westerly gale set in at 12.13 p. m. and ended before 4 p. m. At midnight on the 8th off-shore signals were hoisted on the Atlantic coast from Eastport to the Delaware capes and the next morning they were extended to Cape Hatteras and continued during the day. Northwesterly gales were experienced along the line of signal display.

VI.—The track of this storm as indicated on the chart was near the northern boundary of the United States. Commencing in Oregon on the 8th it passed into the Gulf of Saint Lawrence on the 12th. The departure from the normal at its centre averaged about .40 inch. On the morning of the 10th it was central in Manitoba. Another slight depression prevailed in Colorado, which apparently influenced the main centre so that its course was changed to slightly southeasterly and the two united in a single depression central in Minnesota, with a tongue of low pressure extending southwesterly into Colorado. During the 11th, while the depression was central over Lake Superior, gales occurred on that lake and near the Strait of Mackinac. But light rains accompanied this depression, which passed into the Gulf of Saint Lawrence on the 12th. On Lake Superior on the 10th and 11th the winds were strong from the southwest and reached 30 miles at Marquette. On Lake Michigan the winds were fresh and southerly except at the Strait of Mackinac where a southwest gale occurred on the afternoon of the 11th.

VII.—This depression was first central near Cape Flattery on the 12th and the morning of the 13th, with heavy rains and gales in the north Pacific coast region. The depression was below the normal about .52 inch. It skirted our northern boundary and was central in Manitoba on the 15th, and caused some precipitation during that date on the lakes and high winds on Lake Superior. The remainder of its course was easterly with a uniform speed and was unaccompanied by any remarkable features. Cautionary signals were ordered on Lake Superior in the early morning of the 14th. Southwest and west winds, brisk and occasionally high, occurred on Lake Superior on the 15th. Brisk south veering to northwest winds occurred in northern portions of Lake Michigan. On the early morning of the 15th signals were ordered for all stations on Lakes Michigan and Huron, a number of which were justified on the west Lake Michigan shore; the winds were also brisk on the east shore. A thunder-storm occurred near the Strait of Mackinac, moving north. On Lake Huron a brisk southwest wind prevailed, but signals were not justified.

VIII.—This depression developed from within a large barometric area below the normal and was first central in New England near Portland, Maine, on the morning of the 13th. Its movement was northeastward and its development was decided with its progress. Considerable rain with thunder-storms and calms or variable winds and tornado appearances preceded its development in New England, and rain accompanied its course. Within twenty-four hours it had moved over Newfoundland, and soon passed beyond observation; severe gales were reported in its path. Near Portland, Maine, a severe storm occurred, blowing down trees and unroofing houses, and at about noon of the 13th several vessels at Rockland dragged anchor and a house was blown from its foundation. At Eastport, Maine, a severe thunderstorm occurred, and the first snow of the season followed the passage of the depression.

IX.—On the morning of the 18th the pressure was below the normal in the northern sections of Dakota and Montana and northward; the depression also extended southwestward. The centre moved slowly southeastward, and during the 19th was felt in the upper lakes. While the centre was near Lake Superior a tongue of low barometer extended southwest to Colorado, and steep gradients prevailed over the upper lake region and decided southwesterly gales resulted. During the 20th high areas overlaid both the southeast and northwest sections, and the centre of low barometer was rapidly pushed down the Saint Lawrence valley. The zone of relatively low pressures continued during this date between the

high areas and developed into storm-centre number x. By midnight of the 20th the rapid movement of this low had pushed it beyond observation. On the afternoon of the 18th signals were ordered on Lake Superior, at Milwaukee, Grand Haven, and at the Strait of Mackinac. Signals were soon after ordered at all stations on the upper lakes to Port Huron. Gales were general but no disasters were reported.

X.—Low area number x was generated by the high areas on each side of it and out of a tongue of low pressure extending from ne. to sw. from Canada to Colorado. During the 20th, the pressure was very near the normal at the place of its formation, but there was a distinct cyclonic circulation in the upper Mississippi valley central over the state of Iowa. A decided cold wave was to the northwest of this storm and rain fell in advance of it. Gales commenced on the lakes and continued during the 20th to the 23d, with severe weather and numerous snow-storms. The rate of movement was greatest while passing over the lake region. The first snow of the season fell at most of the Lake Erie stations, while very rough weather was reported on that lake. Hail also fell at several stations in the path of the storm. On Lake Ontario the gales were very severe, and much damage might have been done except for the announcement by signal of its approach. On Lake Ontario, the schooner "Jessie Drummond," was damaged. The first snows of the season on Lake Michigan occurred while the influence of this low was felt. By midnight of the 22d, while this area was central in the lower Saint Lawrence valley, its central line of direction was changed slightly to the southeast and by the morning of the 24th it was no longer apparent. Signals continued at the stations on the lakes on the 19th, having been extended to include all lake stations, the dangerous conditions arising from low area number ix. not yet having passed away. The observer at Toledo reports that the signal was timely and of much benefit. The class of gusty or squally winds which prevail near his station on the approach and passage of low followed by high barometric areas, are those most dangerous and most feared. Hail accompanied the storm at most places on the lakes. On the Atlantic coast the storm was dangerous. Vessels bound for Eastport, Maine, were late and many detained. The signal was not justified by the wind velocity reached, but the observer reports that it was popularly considered justified.

XI.—A slight depression appeared in Manitoba with a cyclonic tendency on the midnight chart of the 23d. Its advance was preceded by cold threatening weather and snow. On the 24th, when near the upper lake region, severe gales occurred with rain and snow. During the 25th it rapidly moved eastward in advance of a "high," and died out upon reaching Maine. Its influence during the early part of the 25th was felt in the lower lake region by the occurrence of severe gales. Signals were ordered for this storm on the lakes as far east as Buffalo on the morning of the 24th. Signals were not justified by reported velocities on Lake Superior, but on Lake Michigan they were, where in some cases the winds were reported the severest of the season. On Lake Huron the schooner "Garret P. Smith" went ashore and was lost. At Detroit the southerly gale was severe and detained many vessels. On Lake Erie dangerous winds occurred and detained many vessels, and the signal was of benefit, but the registered velocities in some cases failed to show a verification. At Buffalo the signal was late, and it would have been better if the hoist of the previous day had continued, as many vessels, seeing no signal displayed, cleared the harbor but were compelled to return. On Lake Ontario the storm prevailed during the 24th and ended during the afternoon. As this depression passed off the Atlantic coast high northwest winds occurred, but no damage was reported, nor were the winds dangerous, as the high velocities generally lasted for a short time.

XII.—This depression first appeared north of Montana and took an easterly movement. During the 25th the pressure was below the normal in the districts west of the Mississippi river, and by midnight distinct depressions could be seen central in Colorado and Manitoba, but by the morning of the 26th the centre in Colorado was no longer apparent, but that in Manitoba continued its easterly course. Rain preceded this disturbance in the Missouri and upper Mississippi valleys, and early on the 26th gales occurred on Lake Superior. During the 27th gales were frequent over the lower lakes while the centre was passing to the northward. Signals were ordered on the early morning of the 26th on Lakes Superior, Michigan and Huron, and later in the day extended to include Lake Ontario. In the afternoon signals were changed to northwest on Lakes Superior and Michigan. The observer at Escanaba reports damage done at Sturgeon Bay and that the gales were very severe in northern Lake Michigan. In the southern portion of the lake the winds were also dangerous. On Lake Huron the winds were dangerous but the reported velocities were not sufficiently high to justify signals. The signal displays were generally verified on Lake Erie by strong southerly gales. Southerly gales occurred on Lake Ontario during the night of the 26th and 27th. The winds became brisk on the Maine coast and in the Bay of Fundy as this depression passed to the north.

XIII.—This low area was first apparent with a depression in Montana at midnight of the 29th. Its course is shown on the chart, and while it passed into the lake region it was accompanied by a few gales and cloudy weather with rain. It is traced to Georgian Bay at midnight of the 31st, when the discussion closes. Signals were ordered at Duluth at the afternoon report of the 30th, and followed on all the lakes at midnight. They were changed to northwest on the 31st. These signals were generally justified by moderate gales.

XIV.—This depression suddenly appeared in Washington Territory at the afternoon observation of the 30th, by the morning of the next day it has moved to northern Montana. It moved thence as a slight depression during the 31st southeastward, and by midnight it was central in the Missouri valley.

## NORTH ATLANTIC STORMS DURING OCTOBER, 1884.

[*Pressure expressed in inches and in millimetres; wind-force by scale of* 0-10.]

The paths of the atmospheric depressions that have appeared in the north Atlantic ocean during the month, have been approximately determined from reports of observations furnished by captains and agents of ocean steamships and sailing vessels; from data obtained through the co-operation of the Hydrographic office, U. S. Navy, and the "New York Herald Weather Service," and from other miscellaneous data received at this office up to November 23d.

To the Hydrographic office, U. S. Navy, the Chief Signal Officer desires particularly to express his indebtedness for valuable data furnished through the kindness and courtesy of the officers there on duty.

The probable paths of fourteen atmospheric disturbances are shown on the chart for October, 1884; of this number, seven were continuations of depressions which passed over the United States and Canada. The disturbances charted as 5 and 5*a* were tropical hurricanes, and were probably one and the same, but, owing to the absence of reliable data for the 10th and 11th, it has been deemed advisable to indicate their paths by separate tracings. That traced as 5*a* displayed great energy, causing much damage to shipping and other property, in and near the Bahama Islands during the period from the 12th to 16th.

During the first and second decades of the month, an area of high barometer occupied the ocean between W. 30° and the European coasts, and this appears to have checked the advance of some of the depressions, while the others have moved northeastward at higher latitudes than usual. As regards the general character of the weather over the Atlantic north of 40° north latitude during October, 1884, it may be summarized as follows: 1st to 6th, moderate to strong gales, mostly from s. through sw. to wnw., with rainy or cloudy weather and high

sea; 6th to 13th, generally moderate breezes, clear weather, smooth sea and occasional fogs; from the 13th to the close of the month, moderate to strong sw. to nw. gales, squally weather and high sea.

The following descriptions refer to the depressions charted:

**1.**—This depression was shown near N. 56° W. 35° on the 1st, the pressure at the centre being about 29.0 (736.6). The lowest reported barometric reading was 29.03 (737.3), recorded by Captain H. C. Williams, commanding the s. s. "Oregon," in N. 55° 22′, W. 38° 52′, wind n., force 7, showery. Vessels between N. 50° and 55°, and W. 35° and 28° had westerly and northwesterly winds of force 6 to 8, with barometer ranging from 29.26 (743.2) to 29.49 (749.0); to the eastward of W. 28° the winds were south-southwesterly and southwesterly, shifting during the day to west. On the 2d the depression was off the northwestern coast of Ireland, causing strong southwesterly breezes over Saint George's Channel and westerly breezes at sea.

**2.**—This was a continuation of the disturbance traced over Canada and the Gulf of Saint Lawrence and described as low area i., under "Areas of low barometer." On the 2d the depression was near the eastern coast of Newfoundland, the lowest reported pressure being 29.44 (747.8), wind wsw., force 4, light rain; vessels to the eastward of W. 50° had moderate southerly breezes, and pressure ranging from 29.7 (754.4) to 29.9 (759.4), while those between W. 55° and the coast of Nova Scotia had northwesterly winds of moderate force. By the 3d the centre of disturbance was near N. 50°, W. 37°, where the barometer read 29.3 (744.2); strong southerly gales occurred over the region between W. 35° and 30° and N. 45° and 50° with westerly winds on the fiftieth parallel. The following vessels were in the vicinity of the storm-centre: s. s. "Wisconsin," C. L. Rigby, commanding, in about N. 48° 40′, W. 38° 30′ reported that from 1 a. m. till 4 a. m. it blew with hurricane force from sse., with very heavy rain, barometer falling suddenly from 29.54 (753.0) to 29.28 (743.7), with wind shifting to w. by n. The s. s. "Rhynland," J. C. Jamison, commanding, reported in lat. 37° 48′ N., long 43° 24′ W., at 2 hours on the 2d, barometer 29.75 (755.6), gradually falling, wind s., increasing; at 14 hours, in N. 48° 26′, W. 39° 38′, barometer, 29.29 (744.0), sw. gale with heavy squalls and high sea; 18 hours 36 minutes, in N. 43° 37′, W. 38° 35′, barometer 29.30 (744.2), rising slowly, wind unsteady, from w. to nw., fresh breeze. The s. s. "Gallia," M. Murphy, commanding, in about N. 49° W. 35°, on the 3d, had heavy gale from ssw., with heavy rain squalls, barometer 29.23 (742.4), wind shifting to westward. On the 4th, the pressure over the region east of the twenty-fifth meridian was 30.2 (767.1), while at the centre of disturbance it had increased to 29.7 (754.4); during the day the depression filled in.

**3.**—This was a continuation of the depression traced over the United States and Canada as low area ii. On the morning of the 5th the disturbance was central off the southern coast of Newfoundland, the pressure near the centre being about 29.0 (736.6). Moderate southerly gales prevailed over the region between W. 55° and 50°, with northerly and northwesterly winds to the westward of the first-mentioned meridian. On the 6th the disturbance was shown as an extensive area of low barometer, covering the ocean between N. 40° and 50° and from Nova Scotia eastward to the fortieth meridian. The lowest barometric readings reported within this area were 29.02 (737.1) and 29.16 (740.7) near N. 46°, W. 47°. Southerly gales of force 8 occurred to the eastward of W. 47° with moderate northwesterly winds to the westward. On the 7th the pressure increased to 29.7 (754.4), and by the following day the depression had filled in, the pressure over the ocean east of the fortieth meridian ranging from 30.0 (762.0) to 30.25 (768.3).

**4.**—This was apparently a continuation of low area iii. It passed over the American continent and into the Atlantic from the coast of Nova Scotia on the 6th. On the 7th the centre of disturbance was in the southern part of Newfoundland, vessels on the southeastern part of the Banks reporting moderate southwesterly and westerly gales, with pressure ranging from 29.14 (740.1) to 29.35 (745.5). On the 8th the barometric minimum was near the Strait of Belle Isle, while the area of high pressures to the eastward of the fortieth meridian seemed to be gradually moving to the westward. On the 9th the low area moved northward beyond the fifty-fifth parallel and out of the range of the observations.

**5.**—This was a tropical hurricane, the first indications of which were noted on the 7th and 8th, near the eastern end of Cuba. Prior to and during the 7th, very heavy rains are reported to have occurred in Jamaica; on the 7th, the s. s. "Cienfuegos," F. M. Faircloth, commanding, sailed from Cienfuegos, Cuba, for Santiago, and had strong ne. winds with cloudy weather, barometer 29.8 (756.9). On the morning of the 8th, the "Cienfuegos" was off Cape Cruz, with light ese. breeze and heavy rainfall, wind increasing from 8 a. m. to noon; during the afternoon, the wind shifted to ene. and ne., with heavy rain squalls. At 4 p. m., the vessel was in the harbor of Santiago, and from that time until 9 p. m., the wind blew in hurricane-like squalls, with rain, from e. to nne.; and at 9.30 p. m., it was blowing a hurricane from nne., with barometer down to 29.58 (751.3); by 10 p. m., the wind had shifted to nnw., and was blowing with hurricane force, barometer 29.51 (749.5); at 11 p. m., it was w. by n., with heavy rain squalls, barometer 29.6 (751.8), and rising; at midnight, barometer 29.7 (754.4), wind w. by s., moderating, although the squalls were still heavy and frequent. By noon of the 9th, the wind had shifted to sw., blowing strongly, weather clearing, with barometer 29.85 (758.2).

From the report of the "Cienfuegos," and the following press report, it would appear that the hurricane passed over the eastern end of Cuba:

A hurricane, coming from the direction of Jamaica, passed over Santiago de Cuba, on Wednesday night, (October 8th). Some small vessels in the harbor, and a number of houses in the city, were slightly damaged.

In the absence of reliable data the subsequent path of this cyclone cannot be determined; it did not, however, approach Havana, since the observations at that station during the first decade of the month, do not show the existence of the disturbance; a very slight barometric depression appeared from the 7th till 14th, but during this time the weather remained dry and clear.

**5a.**—This was a tropical hurricane, the centre of which was to the northward of Cuba on the 11th, but its position could not be definitely determined until the 12th. This hurricane may have been identical with that which crossed eastern Cuba on the 8th, but the data received up to date are too meagre to warrant the tracing of a continuous curve.

On the 11th, the s. s. "Ivanhoe," off Cape Maysi, Cuba, had a southwest wind of force 7, increasing during the day to force 8, with heavy rain. Captain Fyfe reported having passed numerous trees and vegetable matter, evidently washed out by heavy rains. The s. s. "Cienfuegos," which was in the harbor of Guantanamo, Cuba, during the 10th, 11th, and 12th, reported light baffling winds from s. to se., with heavy rains during those dates. On the 12th, the storm-vortex was apparently between Crooked Island and Abaco. The s. s. "Ivanhoe," was near the former place at noon of the 12th, and had a sw. gale of force 8 to 10, with heavy rain, barometer 29.6 (751.8) and falling, while the schooners "Josephine," in N. 27°, W. 76° 15′, had ne. gale, blowing in gusts, with squalls of rains, barometer 28.65 (753.1), and "Isabel Alberto," in about N. 27° 41′, W. 75° 21′, had a severe ene. gale with heavy showers of rain and high se. sea-swell, barometer 29.83 (757.7).

During the 13th the hurricane seems to have curved to the east-northeastward in about N. 26°, W. 75°. The steamers "Kehrwieder" and "Jamaican," the former in N. 27° 11′, W. 70° 33′, and the latter in N. 26° 57′, W. 72° 27′, had southeasterly gales of force 7 to 8, with very heavy rain squalls, thunder and lightning, and high sea from all directions, barometer 29.62 (752.3). The "Ivanhoe," during the forenoon of the 13th, had a s. gale of force 10, with terrific squalls, heavy rain, and dark, gloomy weather, and at noon was in N. 26° 11′, W.

74° 23′; at 2 p. m. the wind shifted to e. and blew a whole gale, barometer (correction unknown) 29.10 (739.1), and at 8 p. m. it had shifted to ne., force 10, barometer 29.0 (736.6). The s. s. "Cienfuegos," off Cape Maysi, on the 13th, had strong southwesterly wind, with heavy rain squalls and barometer 29.85 (758.2), rising. During the 13th the progressive movement of the cyclone appears to have been very slow, and on the 14th its centre was again well-defined in about N. 26°, W. 74°. The s. s. "Kehrwieder," during the morning of the 14th had sse. wind of force 9, barometer (correction unknown) 29.58 (751.3); at noon she was latitude 26° 14′ N., longitude 74° 26′ W.; during the afternoon the barometer continued to fall and the wind shifted from s. to se., ese., and e., blowing with hurricane force throughout and with heavy rain squalls from s. and sw.; at 4 p. m. the wind shifted to east, barometer 28.95 (735.3), and at midnight it was ne., moderating. On the same date the "Jamaican," in N. 26° 26′, W. 74° 15′, at noon, reported se. by s. to se. winds of force 5 to 8 and barometer falling until 4 a. m., when there was less wind and the sky became clearer; at sunrise the sky was clear overhead while a dense bank of clouds, like a wall, appeared in the southwest, with a wild and threatening appearance all around the horizon. At 8 a. m, the vessel appeared to steam into the bank of cloud above referred to, and from that time until noon she experienced heavy squalls of wind and rain, with high, confused sea; during the afternoon the wind shifted from sse. to e., and at midnight it was blowing from the ne. with force 9, barometer (correction unknown) 29.25 (742.9). During this time, vessels near the Florida coast had heavy n. gales; those off the Georgia and Carolina coasts had ne. gales, while those to the eastward of the seventieth meridian and between N. 25° and 30° had strong se. winds, steady in direction, but accompanied by heavy rain squalls. On the 15th the storm-centre passed to the eastward of the seventieth meridian; to the westward the winds had shifted to n. and nnw. and blew with the force of a strong gale until midnight of the 15th, the barometer rising gradually. Vessels to the eastward of W. 70° had heavy gales, the wind shifting from se. to s. and sw., with falling barometer, and the strong ne. and e. gales continued in the Gulf Stream and on the thirtieth parallel. On the 16th the storm-centre moved northeastward to about N. 28°, W. 68°, and the heavy gales continued in all quadrants of the disturbance; by the 17th it had passed to the eastward of the sixtieth meridian, without any decrease of energy, as the vessels which came within its influence reported heavy sw. to ne. gales; while those to the westward of 65° had moderate to strong w. and nw. gales. After the 17th this disturbance passed beyond the area covered by the reports as yet to hand.

**6.**—This was a continuation of the depression traced over the United States and Canada as low area v. On the morning of the 9th its centre was over the Gulf of Saint Lawrence; by the following day it had reached the Atlantic, causing moderate southerly breezes over the region east of the fiftieth meridian, and fresh to strong northerly breezes to the westward of that meridian. During the day the disturbance moved north-northeastward, and on the 11th it was shown near N. 55°, W. 38°, the lowest reported pressure in that region being 29.73 (755.1), with moderate to fresh breezes. On the 12th the chart showed the region of least pressure to be to the northward of N. 58°, and between W. 25° and 30°, and by the following day it had disappeared.

**7.**—This was probably a continuation of the disturbance described as low area viii., under "areas of low barometer." It passed over the Maritime Provinces during the 13th, and on the 14th the centre was apparently in Newfoundland, with the pressure below 29.4 (746.7). During the 14th it moved in a northerly direction, and by the 15th the centre of depression was near Greenland, the lowest reported barometric reading being 29.05 (737.9), in N. 55°, W. 45°.

**8.**—This appeared as a slight depression near N. 43°, W. 54° on the 15th; it moved north-northeastward with decreasing pressure at the centre, and on the 15th it was central off the eastern edge of the Banks, with the pressure below 29.4 (746.7) and attended by strong breezes to moderate gales in the eastern quadrants. On the 17th the depression passed northward beyond the limits of the observations.

**9.**—This depression was apparently central near N. 42° and between W. 58° and 62° on the 18th, on which date the pressure in the above-mentioned region was less than 29.6 (751.8), and moderate southeasterly winds were reported on the Banks of Newfoundland, with strong northwesterly breezes to the westward of W. 60°. On the 19th the region of least pressure was shown near N. 50°, W. 40°, where the lowest reported reading was 29.33 (745.0); the wind had shifted to westerly over the Banks, but showed no increase in force; and to the eastward of W. 40° the southerly winds attained the force of a moderate gale. On the 20th the storm-centre was apparently near N. 56° and between W. 25° and 30°; strong westerly breezes to moderate gales prevailed on the fiftieth parallel, from the Banks eastward to W. 30°, with moderate to strong southerly and southwesterly breezes to the eastward of that limit.

**10.**—This depression was shown to the northward of the fiftieth parallel and near W. 45° on the 21st, and was probably a continuation of that traced as low area ix. During the 21st, it caused fresh westerly and southwesterly gales on the Banks, and as it moved northeastward the pressure apparently decreased until it reached 28.98 (736.1), on the 22d, near N. 56°, W. 34°. Moderate to strong westerly gales prevailed over the region between N. 47° and 53°, and W. 40° and 30°, with strong northwesterly gales to the westward of the first-mentioned meridian. The disturbance passed beyond the area of the observations during the 22d, but the westerly gales continued without abatement during the 23d.

**11.**—This was a slight depression which apparently originated near N. 52°, W. 20° during the 21st. The chart for the 22d showed no material change in the position of the storm-centre, but by the following day it had approached the Irish coast, the winds having shifted to northerly between W. 12° and W. 20°. On the 24th the depression had apparently moved into the Bay of Biscay.

**12.**—This was a continuation of low area x. It passed off the coast of Nova Scotia into the Atlantic on the night of the 23d, and on the following morning it was central south of Newfoundland, attended by fresh to strong southerly gales to the eastward of the storm-centre. At the same time an area of high pressure occupied the region east of the Banks, and by the 25th this depression had apparently filled in.

**13.**—This was a disturbance which appeared on the 25th to the northward of N. 55° and near W. 20°, where the pressure was less than 29.5 (749.3). It apparently passed eastward, causing strong westerly gales from N. 53° northward and between W. 20° and the British coast.

**14.**—On the 30th an extensive depression apparently occupied the ocean from N. 48° to 58° and between W. 35° and 20°. Within this region the pressure ranged from 29.23 (742.4) to 29.49 (749.0). The barometric minima were to the northward of the fifty-fifth parallel at the close of the month.

## OCEAN ICE.

On chart i. are shown the positions of the icebergs observed in the north Atlantic ocean during October, 1884, as obtained from reports sent to this office by ship-masters; reports furnished through the co-operation of the "New York Herald Weather Service," and from other data published in the "New York Maritime Register."

In view of the small number of icebergs reported during October, 1884, it would appear that the probability of encountering those obstacles to navigation is now comparatively slight, at least within the routes of vessels between the United States and Europe; they may, however, be met with near the Strait of Belle Isle and along the eastern and southern coasts of Newfoundland.

In October, 1883, a few bergs were observed between N. 46° 56′, W. 46° 22′, and N. 48° 18′, W. 47° 34′.

In October, 1882, no icebergs were reported.

Icebergs were observed during October, 1884, as follows:

2d.—Bark "Fluorine," in N. 46° 56′, W. 50° 55′, passed a large iceberg.

22d.—S. S. "Venetian" passed an iceberg, eight miles east of Cape Race.

26th.—S. S. "Lake Manitoba" observed a large iceberg north of the entrance to Belle Isle Strait, and a smaller one off Cape Norman.

The "New York Maritime Register" of October 22d, publishes the following:

Captain Joseph S. Frazier, of the schooner "Admiral," which arrived at Gloucester, Massachusetts, October 20th, from the Banks, says he counted seventeen icebergs south from Cape Pine, and forty-seven in sight five miles northeast of Cape Race. One of them was three miles long.

## TEMPERATURE OF THE AIR.

[*Expressed in degrees, Fahrenheit.*]

The distribution of mean temperature over the United States and Canada for October, 1884, is exhibited on chart ii. by the dotted isothermal lines; and on chart iv., is shown the departures from the October normal. The last named chart shows that the mean temperatures are slightly below the normal in the following districts: along the immediate California coast; in the vicinity of Portland, Oregon; New England and eastern New York; southern Florida; southwestern Arizona, and in the central and southern portions of Texas. In all other districts, the mean temperatures are above the normal. Chart ii. shows three separate areas over which the departures are from 4° to 7°, viz.: (1) western Montana; (2) the southern portions of Dakota, Minnesota and Wisconsin, Nebraska, and portions of Iowa, Kansas, Colorado, New Mexico and Arizona; (3) the lower Ohio and central Mississippi valleys, Tennessee, and the south Atlantic states. In the other districts, where the temperatures are above the normal, the departures vary from 1° to 4°. In the following table are shown the normal temperatures for the month of October for a series of years; the mean temperatures for October, 1884; and the departures from the normal for each of the several geographical districts, as determined from the records of the Signal Service:

*Average temperatures for October, 1884.*

| Districts. | Average for Oct. Signal-Service observations. | | Comparison of Oct., 1884, with the average for several years. |
|---|---|---|---|
| | For several years. | For 1884. | |
| | ° | ° | ° |
| New England | 52.4 | 51.9 | −0.5 |
| Middle Atlantic states | 58.0 | 58.9 | +0.9 |
| South Atlantic states | 65.6 | 68.6 | +3.0 |
| Florida peninsula | 74.5 | 75.1 | +0.6 |
| Eastern Gulf states | 67.0 | 70.7 | +3.7 |
| Western Gulf states | 67.9 | 69.7 | +1.8 |
| Rio Grande valley | 74.9 | 73.8 | −1.1 |
| Tennessee | 61.0 | 65.6 | +4.6 |
| Ohio valley | 57.4 | 60.4 | +3.0 |
| Lower lake region | 51.4 | 52.8 | +1.4 |
| Upper lake region | 47.7 | 49.9 | +2.2 |
| Extreme northwest | 42.3 | 44.8 | +2.5 |
| Upper Mississippi valley | 53.6 | 57.6 | +4.0 |
| Missouri valley | 49.9 | 54.2 | +4.3 |
| Northern slope | 43.0 | 48.3 | +5.3 |
| Middle slope | 52.6 | 56.6 | +4.0 |
| Southern slope | 62.7 | 63.5 | +0.8 |
| Northern plateau | 46.9 | 49.8 | +2.9 |
| Southern plateau | 60.2 | 62.2 | +2.0 |
| North Pacific coast region | 50.3 | 50.8 | +0.5 |
| Middle Pacific coast region | 60.3 | 59.6 | −0.7 |
| South Pacific coast region | 65.5 | 63.9 | −1.6 |
| Mount Washington, N. H | 30.5 | 28.4 | −2.1 |
| Pike's Peak, Colo | 21.0 | 24.4 | +3.4 |
| Salt Lake City, Utah | 50.6 | 52.6 | +2.0 |

### DEVIATIONS FROM MEAN TEMPERATURE.

The departures exhibited by the reports from the regular Signal Service stations are shown in the table of average temperatures for October, 1884. Voluntary observers report the following notes in connection with this subject:

*Arkansas.*—Lead Hill, Boone county: mean temperature, 63°2, is 0°.2 below the October average for the three preceding years.

*Dakota.*—Webster, Day county: mean temperature, 52°.3, is 1°.4 below the October average for the two preceding years.

*Illinois.*—Mattoon, Coles county: mean temperature, 57°.0, is 1°.1 above the October average for the last four years.

Anna, Union county: mean temperature, 64°.6, is 4°.2 above the October average for the past nine years.

Riley, McHenry county: mean temperature, 51°.5, is 4°.5 above the October average for the last twenty-four years; in only two years of that period has October been warmer, viz: in 1879 and 1882. The temperature did not fall below 32° from April 22d to October 22d (one hundred and eighty-four days); in only one year, viz., 1878, of the above period has the temperature remained above freezing so long.

Sycamore, DeKalb county: mean temperature, 51°.3, is 1° below the October average for the last four years.

*Indiana.*—Spiceland, Henry county: mean temperature, 56°, is 5° above the October average for the last thirty years.

Logansport, Cass county: mean temperature, 59°.2, is 6° above the October average for the last twenty-five years.

Wabash, Wabash county: mean temperature, 54°.5, is 2°.1 above the October average for the last nine years.

*Kansas.*—Yates Centre, Woodson county: mean temperature, 58°.8, is 4°.1 above the October average for the last four years.

Lawrence, Douglass county: mean temperature, 57°.9, is 3°.3 above the October average for the last seventeen years.

Independence, Montgomery county: mean temperature, 60°.8, is 1°.7 above the October average for the last thirteen years.

Wellington, Sumner county: mean temperature, 60°.6, is 3°.4 above the October average for the last six years.

*Maine.*—Gardiner, Kennebec county: mean temperature, 47°.8, is 0°.4 above the October average for a period of forty-eight years.

*Maryland.*—Fallston, Harford county: mean temperature, 56°.4, is 0°.9 above the October average for the last fourteen years.

*Massachusetts.*—Worcester, Worcester county: mean temperature, 48°.7, is 2°.3 below the October average for the last forty-five years.

*Missouri.*—Saint Louis: mean temperature, 62°.8, is 6°.7 above the October normal.

*New Jersey.*—South Orange, Essex county: mean temperature, 54°.2, is 0°.6 above the October average for the last fifteen years.

*New York.*—North Volney, Oswego county: mean temperature, 50°.2, is 1°.1 above the October average for the last seventeen years.

Palermo, Oswego county: mean temperature, 47°.8, is 0°.8 above the October average for the last thirty-one years.

Cooperstown, Otsego county: mean temperature, 48°.3, is 3° above the October normal.

*Ohio.*—Wauseon, Fulton county: mean temperature, 53°.2, is about 0.1 above the October average for the last fourteen years.

*Pennsylvania.*—Dyberry, Wayne county: mean temperature, 49°.0, is 2° above the October average for the last seventeen years.

*Tennessee.*—Ashwood, Maury county: Mr. C. F. Williams reports that his meteorological record, extending back twenty-seven years, shows that the high temperatures during the first eight days of the month have been unprecedented.

*Texas.*—New Ulm, Austin county: mean temperature, 69°.9, is 0.3 below the October average for the last thirteen years.

*Vermont.*—Woodstock, Windsor county: mean temperature, 45°.9, is 1°.2 above the October average for the last seventeen years.

*Virginia.*—Wytheville, Wythe county: mean temperature,

58°.4, is 4°.5 above the October average for a period of twenty years.

Variety Mills, Nelson county: mean temperature, 59°.1, is 0°.9 above the October average for the last seven years.

*West Virginia.*—Helvetia, Randolph county: mean temperature, 54°.0, is 1°.4 above the October average for last eight years.

*Wisconsin.*—Madison: mean temperature, 51°.5, is 3° above the October average for the last thirty-one years.

*Table of comparative maximum temperatures for the month of October.*

| State or Territory. | Maximum for October, 1884, Signal Service. | | Maximum since Signal-Service stations were opened—3 to 13 years. | | | Highest from any other source. | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Station. | Temperature. | Station. | Temperature. | Year. | Place. | Temperature. | Year. | Length of record. |
| | | ° | | ° | | | ° | | Years. |
| Alabama | Mobile | 93 | Mobile | 91 | 1883 | Mount Vernon Arsenal | 96 | | 31 |
| Do | Montgomery | 96 | Montgomery | 95 | 1883 | Mobile | 94 | | 33 |
| Arizona | Phœnix | 100 | Stanwix | 103 | 1870 | Fort McDowell | 108 | | 15 |
| Do | San Carlos | 95 | Yuma | 102 | 1876, 1879 | Fort Mojave | 105 | | 4 |
| Arkansas | Fort Smith | 95 | Fort Smith | 95 | 1883 | Fort Smith | 91 | | 21 |
| Do | Little Rock | 90 | Little Rock | 91 | 1881 | Little Rock | 90 | | 28 |
| California | Los Angeles | 89 | Los Angeles | 96 | 1879 | Fort Yuma | 105 | | 31 |
| Do | Red Bluff | 87 | Red Bluff | 94 | 1877 | San Diego | 103 | 1859 | 17 |
| Colorado | Denver | 80 | Denver | 86 | 1873 | Fort Lyon | 92 | | 19 |
| Do | Pike's Peak | 40 | Pike's Peak | 45 | 1875 | Fort Garland | 80 | | 22 |
| Connecticut | New Haven | 81 | New Haven | 86 | 1881 | Columbia | 88 | | 10 |
| Do | New London | 79 | New London | 83 | 1879 | New Haven | 83 | | 87 |
| Dakota | Fort Buford | 86 | Fort Buford | 95 | 1879 | Fort Buford | 96 | | 9 |
| Do | Yankton | 87 | Yankton | 89 | 1879 | Fort Sully | 93 | | 8 |
| Delaware | Delaware Breakwater | 83 | Delaware Breakwater | 84 | 1881 | Fort Delaware | 88 | | 44 |
| District of Columbia | Washington City | 90 | Washington City | 92 | 1881 | Washington City | 90 | | 49 |
| Florida | Key West | 87 | Key West | 92 | 1876 | Fort King | 99 | | 10 |
| Do | Jacksonville | 92 | Jacksonville | 92 | 1883 | Key West | 93 | | 23 |
| Georgia | Atlanta | 91 | Atlanta | 86 | 1883 | Atlanta | 92 | | 4 |
| Do | Augusta | 94 | Augusta | 90 | 1881 | Augusta Arsenal | 92 | | 48 |
| Idaho | Boisé City | 77 | Boisé City | 85 | 1879, 1880 | Fort Boisé | 95 | | 10 |
| Do | Lewiston | 74 | Lewiston | 84 | 1880 | Fort Hall | 90 | | 3 |
| Illinois | Chicago | 83 | Chicago | 84 | 1879 | Chicago | 90 | | 38 |
| Do | Cairo | 88 | Cairo | 88 | 1881 | Manchester | 90 | | 11 |
| Indiana | Indianapolis | 87 | Indianapolis | 86 | 1879 | Vevay | 96 | | 15 |
| Do | Greencastle | 86 | | | | New Harmony | 86 | | 11 |
| Indian Territory | Cantonment | 88 | Fort Sill | 91 | 1878 | Fort Sill | 96 | | 10 |
| Do | | | Fort Gibson | 89 | 1879 | Fort Gibson | 95 | | 46 |
| Iowa | Keokuk | 86 | Keokuk | 87 | 1879 | Muscatine | 87 | | 27 |
| Do | Dubuque | 85 | Dubuque | 86 | 1879 | Algona | 86 | | 9 |
| Kansas | Dodge City | 83 | Dodge City | 90 | 1883 | Fort Larned | 98 | | 14 |
| Do | Leavenworth | 86 | Leavenworth | 89 | 1874 | Fort Riley | 97 | | 21 |
| Kentucky | Louisville | 90 | Louisville | 88 | 1879 | Chilesburg | 88 | | 3 |
| Do | | | | | | Newport Barracks | 85 | | 27 |
| Louisiana | Shreveport | 93 | Shreveport | 95 | 1883 | Baton Rouge | 91 | | 52 |
| Do | New Orleans | 90 | New Orleans | 89 | 1883 | Fort Jesup | 91 | | 23 |
| Maine | Eastport | 68 | Eastport | 80 | 1879 | Brunswick | 88 | | 53 |
| Do | Portland | 79 | Portland | 83 | 1879, 1881 | Fort Sullivan | 87 | | 51 |
| Maryland | Baltimore | 89 | Baltimore | 89 | 1879, 1881 | Fort Washington | 92 | | 37 |
| Do | Ocean City | 84 | | | | Fort McHenry | 89 | | 43 |
| Massachusetts | Boston | 83 | Boston | 90 | 1881 | Topsfield | 87 | | 5 |
| Do | Thatcher's Island | 78 | Springfield | 86 | 1881 | Williamstown | 85 | | 55 |
| Michigan | Marquette | 82 | Marquette | 87 | 1879 | Monroe | 89 | | 11 |
| Do | Port Huron | 84 | Port Huron | 86 | 1879 | Ontonagon | 89 | | 12 |
| Minnesota | Moorhead | 78 | Breckenridge | 89 | 1879 | Fort Snelling | 90 | | 61 |
| Do | Saint Paul | 81 | Saint Paul | 87 | 1879 | Fort Ridgeley | 87 | | 12 |
| Mississippi | Vicksburg | 94 | Vicksburg | 93 | 1883 | Vicksburg | 90 | | 4 |
| Do | | | | | | Columbus | 89 | | 10 |
| Missouri | Saint Louis | 88 | Saint Louis | 90 | 1879 | Allenton | 100 | | 4 |
| Do | | | Springfield | 82 | 1882 | Saint Louis | 95 | | 38 |
| Montana | Fort Custer | 86 | Fort Custer | 87 | 1879 | Fort Shaw | 91 | | 8 |
| Do | Fort Benton | 81 | Fort Benton | 87 | 1875 | Fort Benton | 85 | | 4 |
| Nebraska | Omaha | 86 | Omaha | 87 | 1879 | Fort McPherson | 102 | | 14 |
| Do | North Platte | 83 | North Platte | 89 | 1879 | Fort Calhoun | 96 | | 5 |
| Nevada | | | | | | Fort Ruby | 101 | | 6 |
| Do | | | | | | Camp Halleck | 93 | | 7 |
| New Hampshire | Mount Washington | 56 | Mount Washington | 58 | 1882 | Auburn | 88 | | 6 |
| Do | | | | | | Fort Constitution | 79 | | 33 |
| New Jersey | Sandy Hook | 81 | Sandy Hook | 87 | 1881 | Vineland | 92 | | 7 |
| Do | Atlantic City | 83 | Atlantic City | 83 | 1881 | Newark | 83 | | 10 |
| New Mexico | Fort Craig | 86 | La Mesilla | 96 | 1878 | Fort Cummings | 106 | | 4 |
| Do | Fort Stanton | 74 | Santa Fé | 85 | 1878 | Fort Fillmore | 99 | | 10 |
| New York | New York City | 86 | New York City | 88 | 1882 | Poughkeepsie | 95 | | 21 |
| Do | Rochester | 86 | Rochester | 87 | 1879 | Mexico | 92 | | 13 |
| North Carolina | New River Inlet | 93 | Cape Hatteras | 90 | 1881 | Fort Johnson | 90 | | 54 |
| Do | Kitty Hawk | 86 | Kitty Hawk | 90 | 1881 | Fort Macon | 85 | | 15 |
| Ohio | Cincinnati | 88 | Cincinnati | 86 | 1879 | Cincinnati | 90 | | 36 |
| Do | Columbus | 87 | Columbus | 86 | 1879 | College Hill | 89 | | 57 |
| Oregon | Roseburg | 76 | Umatilla | 86.5 | 1880 | Fort Dalles | 100 | | 16 |
| Do | Portland | 72 | Portland | 79 | 1876 | Fort Hoskins | 89 | | 9 |
| Pennsylvania | Philadelphia | 84 | Philadelphia | 87 | 1879, 1881 | Mount Joy | 90 | | 10 |
| Do | Pittsburg | 91 | Pittsburg | 91 | 1879 | Philadelphia | 88 | | 113 |
| Rhode Island | Narragansett Pier | 79 | Newport | 81.5 | 1879 | Providence | 85 | | 35 |
| Do | Block Island | 74 | New Shoreham | 75 | 1881 | Newport | 79 | | 5 |
| South Carolina | Charleston | 91 | Charleston | 89 | 1881 | Charleston | 89 | | 104 |
| Do | | | | | | Fort Moultrie | 88 | | 38 |
| Tennessee | Memphis | 92 | Memphis | 92 | 1879 | Humboldt | 88 | | 4 |
| Do | Knoxville | 94 | Knoxville | 90.5 | 1879 | Glenwood Cottage | 87 | | 11 |
| Texas | Rio Grande City | 93 | Rio Grande City | 105 | 1877 | Fort McIntosh | 104 | | 25 |
| Do | Fort Concho | 92 | Uvalde | 105 | 1877 | Camp Stockton | 102 | | 15 |
| Utah | Salt Lake City | 80 | Salt Lake City | 83 | 1876 | Camp Douglas | 99 | | 18 |
| Do | Fort Thornburg | 82 | | | | Fort Crittenden | 86 | | 2 |
| Vermont | | | Burlington | 78 | 1879 | Lunenburg | 84 | | 15 |
| Virginia | Norfolk | 90 | Fort Myer | 90 | 1879 | Fortress Monroe | 89 | | 54 |
| Do | Lynchburg | 91 | Lynchburg | 88 | 1879 | Alexandria | 80 | | 11 |
| Washington Territory | Dayton | 74 | Dayton | 92 | 1880 | Fort Walla Walla | 88 | | 10 |
| Do | Olympia | 66 | Olympia | 73 | 1880 | Fort Vancouver | 82 | | 18 |
| West Virginia | | | Morgantown | 85 | 1879 | Helvetia | 88 | | 4 |
| Wisconsin | La Crosse | 84 | La Crosse | 84 | 1879 | Fort Crawford | 80 | | 25 |
| Do | Milwaukee | 83 | Madison | 84 | 1879 | Fort Howard | 84 | | 30 |
| Wyoming | Cheyenne | 77 | Cheyenne | 80 | '73, '74, '79 | Fort Laramie | 90 | | 25 |
| Do | Fort Bridger | 80 | Fort Washakie | 70 | 1882 | Fort Sanders | 90 | | 8 |

### MONTHLY RANGES OF TEMPERATURE.

The monthly ranges of temperature were greatest in the upper Missouri valley and least along the Pacific and Gulf coasts; they varied in extremes from 16° at Key West, Florida, and 25° at Fort Canby, Washington Territory, to 72° at Fort Buford, Dakota, and 74° at Forts Totten and Yates, Dakota. In the table of miscellaneous meteorological data are shown the monthly and daily temperature ranges for the several stations of the Signal Service.

### ABNORMALLY HIGH TEMPERATURES.

The following notes relating to the unusually warm weather during the earlier part of October have been received:

New River Inlet, North Carolina: the 6th was the hottest day of the year at this place; maximum temperature, 93°.1.

Raleigh, North Carolina: the first half of the month was very hot; the temperature rose to 90° and above, daily from the 1st to 17th, the maximum, 93°, occurring on the 6th.

Augusta, Georgia: the maximum temperature on the 6th was 93°.5, which is unusually high for this season of the year.

Pensacola, Florida: on the 8th the temperature rose to 95°.2, which is higher than the maximum for either August or September preceding.

Chattanooga, Tennessee: the maximum temperature on the 5th, 90°.8, is the highest observed in October since the establishment of this station in 1879.

Ashwood, Maury county, Tennessee: the temperature during the first eight days of the month averaged higher than for any corresponding period in October during the last twenty-seven years; it rose to 94° at 2 p. m. on the 3d, 4th, and 5th.

Wauseon, Fulton county, Ohio: the maximum temperature on the 4th, 87°.7, is the highest by 0°.7 that has been recorded in October during the last fourteen years.

Fort Assinaboine, Montana: the maximum temperature on the 13th was 83°, or 7° above the highest October maximum recorded since this station was established in 1880.

La Crosse, Wisconsin: on October 1st, for the second time this year, several kinds of fruit trees were in bloom and some trees contained green fruit. The second crop of strawberries was ripe on the 20th, at which time all kinds of vegetation presented the same appearance as in spring.

Milwaukee, Wisconsin, 31st: during the unusually warm weather of the first part of the month, the fruit trees in this vicinity were in bloom for the second time this year, and several kinds of the smaller fruits matured and ripened, making the second crop this year.

### FROSTS.

On chart v. are shown the southern limits of the August and September frosts and also the southern limits of the frosts which occurred from October 7th to 10th; 13th to 16th; 21st to 25th, 26th, and 28th to 31st.

In the several districts frosts occurred as follows:

*New England.*—3d, 6th, 7th, 10th, 11th, 12th, 14th, 15th, 16th, 18th, 19th, 24th to 27th, 29th; on the summit of Mount Washington, frosts occurred on the 3d, 7th, 10th, 13th to 19th, 23d to 31st.

*Middle Atlantic states.*—9th, 10th, 11th, 14th to 21st, 23d to 27th, 29th.

*South Atlantic states.*—15th, 16th, 18th, 19th, 23d to 26th.

*East Gulf states.* — Cross Plains, Alabama, 16th, 24th; Athens, Georgia, 16th, 24th; Milledgeville, Georgia, 24th, 25th; Birmingham and Green Springs, Alabama, 24th and 25th.

*West Gulf states.*—Lead Hill, Arkansas, 15th, 16th, 18th, 24th, 28th, 30th, 31st; Mount Ida, Arkansas, 23d, 24th; Fort Smith, Arkansas, 24th, 28th.

*Tennessee.*—16th, 19th, 23d, 24th, 25th, 30th.

*Ohio valley.*—8th, 9th, 10th, 14th, 15th, 16th, 18th, 19th, 23d to 31st.

*Lower lake region.*—7th, 9th, 10th, 12th, 14th, 15th, 17th, 18th, 19th, 23d to 26th, 28th to 31st.

*Upper lake region.*—1st, 5th, 8th, 9th, 10th, 13th, 14th, 15th, 17th, 18th, 22d to 31st.

*Extreme northwest.*—1st, 4th, 7th, 8th, 9th, 11th, 13th, 17th, 18th, 20th, 22d, 23d, 24th, 27th, 30th.

*Upper Mississippi valley.*—8th, 9th, 10th, 12th to 15th, 17th, 18th, 22d to 25th, 27th, 28th, 29th, 31st.

*Missouri valley.*—7th, 8th, 9th, 19th to 31st.

*Northern slope.*—3d, 4th, 6th to 9th, 17th, 20th to 30th.

*Middle slope.*—7th, 8th, 9th, 12th, 13th, 16th, 17th, 18th, 21st to 31st.

*Southern slope.*—Fort Stanton, New Mexico, 16th, 17th, 27th to 30th; Fort Davis, Texas, 28th to 31st.

*Southern plateau.*—5th, 8th, 20th, 21st, 25th to 31st.

*Middle plateau.*—1st to 5th, 7th to 12th, 14th to 27th, 29th, 30th, 31st.

*Northern plateau.*—1st to 7th, 20th to 29th.

*North Pacific coast region.*—1st, 2d, 3d, 5th, 6th, 7th, 24th, 25th, 26th.

*Middle Pacific coast region.*—Sacramento, California, 1st to 4th, 26th; San Francisco, California, 2d; Princeton, California, 2d.

### ICE.

The formation of ice in the various states and territories occurred as follows:

*Arkansas.*—Lead Hill, 24th, 28th.

*Connecticut.*—Hartford, 15th, 19th, 24th, 26th.

*Dakota.*—Webster, 8th, 27th; Fort Sully, 8th, 23d; Fort Totten, 7th, 8th, 31st, the temperature falling to 12° on the latter date, when the bay froze over.

*Georgia.*—Forsyth, Athens, and Atlanta, 24th.

*Illinois.*—Riley, Mattoon, Chicago, and Springfield, on the 23d.

*Indiana.*—Wabash and Greencastle, 23d; Laconia and Summan, 24th.

*Iowa.*—Manchester, 9th; Humboldt and Round Grove, 22d; Fort Madison, Logan, Oskaloosa, Dubuque, Des Moines, and Davenport, on the 23d.

*Kansas.*—Independence and Yates Centre, 22d.

*Kentucky.*—Richmond, 24th.

*Maine.*—Cornish, 10th; Bangor, 10th, 16th; Eastport, 16th, 19th.

*Maryland.*—Fallston, 26th.

*Massachusetts.*—Somerset and Westborough, 10th; Heath, 14th; Fall River, 10th, 15th, 16th; Taunton, 19th, 26th.

*Michigan.*—Lansing and Marquette, 22d; Ionia, 9th, 23d, 24th, 25th, 29th; Escanaba, 22d, 23d, 25th, 28th; Port Huron, 24th.

*Minnesota.*—Chester, 17th, 23d, 25th, 27th; Duluth, 22d; Moorhead, 8th; Saint Paul, 23d.

*Nebraska.*—Genoa, 1st, 29th; Stockham, 20th; Omaha, 23d.

*New Jersey.*—Moorestown, 10th; Barnegat City and Little Egg Harbor, 26th; Cape May, 19th.

*New York.*—Menand Station (near Albany), 15th, 19th, 26th; Mountainville, 10th, 26th; Humphrey, 9th, 15th; Rochester, 15th; Oswego, 26th.

*North Carolina.*—Weldon, 24th; Flat Rock, 24th, 25th.

*Ohio.*—Margaretta, 26th; North Lewisburg, Portsmouth, Sandusky, and Cleveland, on the 24th; Ruggles, 15th; Wauseon, 9th, 15th, 24th, 25th, 30th; Garrettsville, 15th, 20th; Toledo, 24th, 29th.

*Pennsylvania.*—Cattawissa, 15th, 19th, 26th; Grampian Hills, 15th; Troy, 25th; Drifton and Erie, 26th; Pittsburg, 24th.

*Rhode Island.*—Nayatt Point, 15th, 16th, 24th, 26th; Point Judith, 15th.

*Tennessee.*—Nashville, 24th; Ashwood, 24th, 25th.

*Vermont.*—Charlotte, 15th, 19th; Strafford, 10th, 15th, 18th, 19th, 25th; Burlington, 26th.

*Virginia.*—Lynchburg, 24th; Johnsontown, 25th, 26th.

*Wisconsin.*—Neillsville, 23d, 24th; Madison, 22d; La Crosse, 28th; Beloit, Lancaster, and Milwaukee, 23d.

## PRECIPITATION.

[*Expressed in inches and hundredths.*]

The distribution of rainfall over the United States and Canada, for the month of October, 1884, as determined by the reports from more than eight hundred stations, is exhibited on chart iii.

In the following table are shown for each of the several geographical districts, the average October precipitation for a series of years; the average for October, 1884; and the departures, as deduced from the records of the Signal Service:

*Average precipitation for October, 1884.*

| Districts. | Average for Oct. Signal-Service observations. | | Comparison of Oct., 1884, with the average for several years. |
|---|---|---|---|
| | For several years. | For 1884. | |
| | *Inches.* | *Inches* | *Inches.* |
| New England | 4.09 | 2.84 | −1.25 |
| Middle Atlantic states | 3.31 | 1.83 | −1.48 |
| South Atlantic states | 4.35 | 1.18 | −3.17 |
| Florida peninsula | 5.28 | 2.47 | −2.81 |
| Eastern Gulf states | 3.51 | 2.70 | −0.81 |
| Western Gulf states | 3.92 | 3.28 | −0.64 |
| Rio Grande valley | 2.71 | 10.08 | +7.37 |
| Tennessee | 3.40 | 2.28 | −1.12 |
| Ohio valley | 3.31 | 1.87 | −1.44 |
| Lower lake region | 3.20 | 2.10 | −1.10 |
| Upper lake region | 3.61 | 4.78 | +1.17 |
| Extreme northwest | 1.83 | 2.04 | +0.21 |
| Upper Mississippi valley | 3.33 | 3.54 | +0.21 |
| Missouri valley | 2.19 | 2.73 | +0.54 |
| Northern slope | 1.18 | 0.63 | −0.55 |
| Middle slope | 1.31 | 1.67 | +0.36 |
| Southern slope | 2.65 | 4.58 | +2.93 |
| Southern plateau | 0.75 | 2.05 | +1.30 |
| Northern plateau | 2.21 | 2.22 | +0.01 |
| North Pacific coast region | 4.59 | 3.11 | −1.48 |
| Middle Pacific coast region | 1.18 | 1.82 | +0.64 |
| South Pacific coast region | 0.58 | 0.37 | −0.21 |
| Mount Washington, N. H. | 6.93 | 12.91 | +5.98 |
| Pike's Peak, Colo | 1.53 | 0.99 | −0.54 |
| Salt Lake City, Utah | 1.95 | 0.36 | −1.59 |

The precipitation for October, 1884, was excessive along the southern borders of the country, from the mouth of the Mobile river westward to New Mexico and Arizona, and over a narrow area extending from the territories last named, northeastward to the extreme northwest, and northern part of the upper lake region; the monthly precipitation was also excessive in portions of Idaho, Oregon and Washington Territory, and on the central California coast. The excess has been most marked in the Rio Grande valley, southern slope, southern plateau, and over a part of the upper lake region. At Brownsville, Texas, near the mouth of the Rio Grande river, where the average October rainfall for the last eight years is 3.31, the amount for October, 1884, was 15.71, or nearly five times the average, and at Rio Grande City, it was more than double the October average for the last six years. At El Paso, Texas, where, for the last six years, the average October rainfall is 0.99, for this year it was 5.15, or more than five times the average. At Omaha, Nebraska; Davenport, Iowa, and at Escanaba, Grand Haven and Marquette, Michigan, the monthly rainfalls were about double the average.

The precipitation has been deficient in all districts east of the Mississippi river, with the exception of the northern part of the upper lake region and the southern portions of Alabama and Mississippi. To the westward of a line extending from northern Minnesota to the mouth of the Colorado river, with the exception of central California and portions of Idaho, Oregon, and Washington Territory, the monthly precipitation has also been below the average. The departures in the districts east of the Mississippi river, as in the preceding months, August and September, are very marked, and the seyere drought which prevailed in many of the states continued during October. From the following table, which shows the departures for the months of August, September and October, from the average in the several districts, it will be seen that during these months, in the districts east of the Mississippi river, with the exception of the upper lake region, the precipitation has been abnormally small, while to the westward of the Mississippi, more than the average amount of rain has fallen:

| Districts. | August. | September. | October. | Total. |
|---|---|---|---|---|
| | *Inches.* | *Inches.* | *Inches.* | *Inches.* |
| New England | +1.51 | −2.51 | −1.25 | −2.25 |
| Middle Atlantic states | −0.94 | −3.72 | −1.48 | −6.14 |
| South Atlantic states | −0.70 | −1.63 | −3.17 | −5.50 |
| Florida peninsula | −1.98 | −0.97 | −2.81 | −5.76 |
| East Gulf states | −4.01 | −1.97 | −0.81 | −6.79 |
| West Gulf states | −1.78 | +0.87 | −0.64 | −1.55 |
| Rio Grande valley | −5.19 | +4.37 | +7.37 | +6.55 |
| Tennessee | −1.04 | −1.05 | −1.12 | −3.21 |
| Ohio valley | −1.21 | +1.21 | −1.44 | −1.44 |
| Lower lake region | −0.59 | −0.51 | −1.10 | −2.20 |
| Upper lake region | +0.24 | −0.03 | +1.17 | +1.38 |
| Extreme northwest | +2.20 | +0.64 | +0.21 | +3.05 |
| Upper Mississippi valley | +0.60 | +2.33 | +0.21 | +3.14 |
| Missouri valley | +0.51 | −0.00 | +0.54 | +0.99 |
| Northern slope | +0.36 | +0.27 | −0.55 | +0.08 |
| Middle slope | +1.07 | −1.17 | +0.36 | +0.26 |
| Southern slope | −0.72 | +0.37 | +2.93 | +2.58 |
| Southern plateau | −0.21 | +0.21 | +1.30 | +1.30 |
| Northern plateau | −0.12 | +0.92 | +0.01 | +0.81 |
| North Pacific coast region | −0.18 | +1.05 | −1.48 | −0.61 |
| Middle Pacific coast region | −0.01 | +0.12 | +0.64 | +0.75 |
| South Pacific coast region | −0.05 | −0.03 | −0.21 | −0.29 |

## DEVIATIONS FROM AVERAGE PRECIPITATION.

The departures exhibited by the reports from the regular Signal Service stations are shown in the table of average precipitation for October, 1884. The following notes in connection with this subject are reported by voluntary observers:

*Arkansas.*—Lead Hill, Boone county: monthly precipitation, 0.94, is 9.57 below the October average for the three preceding years.

*Illinois.*—Mattoon, Coles county: monthly precipitation, 2.80, is 3.61 below the October average for the last four years.

Anna, Union county: monthly precipitation, 1.42, is 2.92 below the October average for the last nine years.

Riley, McHenry county: monthly precipitation, 3.85, is 1.29 above the October average for a period of twenty-four years.

Sycamore, De Kalb county: monthly precipitation, 5.76, is 1.03 below the October average for the last four years.

*Table of excessive and greatest monthly precipitation—October, 1884.*

| Station. | Specially heavy. | | Largest monthly. | Station. | Specially heavy. | | Largest monthly. |
|---|---|---|---|---|---|---|---|
| | Date. | Amt. | Amount. | | Date. | Amt. | Amount. |
| *Alabama.* | | | | *Michigan.* | | | |
| Mt. Vernon B'ks | 26, 27, 28 | 4.94 | | Escanaba | 1, 2 | 3.37 | 7.97 |
| Mobile | 26, 27, 28 | 3.83 | | Lansing | 1 | 2.43 | 6.91 |
| Selma | 27, 28, 29 | 2.95 | | Grand Haven | 1, 2 | 2.14 | 6.10 |
| *California.* | | | | Marquette | 2, 3 | 2.65 | 6.02 |
| Delta | | | 6.01? | Do | 20, 21 | 2.13 | |
| *Dakota.* | | | | Ionia | 1 | 2.34 | |
| Fort Sisseton | 4, 5 | 2.50 | | Port Huron | 1, 2 | 2.04 | |
| *Florida.* | | | | *Minnesota.* | | | |
| Pensacola | 26, 27 | 2.33 | | Moorhead | 4, 5 | 2.57 | |
| *Illinois.* | | | | *Nebraska.* | | | |
| Rockford | | | 6.24 | Ashland | | | 6.05 |
| Peoria | 6, 7 | 2.52 | | De Soto | 3, 4 | 2.60 | |
| Wilton Center | 7, 8 | 2.30 | | Omaha | 3, 4 | 3.73 | |
| *Indiana.* | | | | *New Hampshire.* | | | |
| Fort Wayne | 15 | 2.15 | | Mt. Washington | 4, 5 | 4.29 | 12.91 |
| *Iowa.* | | | | Do | 6, 7 | 3.27 | |
| Davenport | 6, 7, 8 | 4.72 | 7.17 | *New Jersey.* | | | |
| Muscatine | 6, 7 | 3.50 | 6.46 | Sandy Hook | 30, 31 | 2.39 | |
| Des Moines | 6, 7 | 3.75 | | *Oregon.* | | | |
| Ottumwa | 7, 8 | 3.17 | | Astoria | | | 6.43 |
| Logan | 3, 4 | 2.60 | | *Rhode Island.* | | | |
| Dubuque | 7, 8 | 2.02 | | Nayatt Point | 12 | 2.30 | |
| *Louisiana.* | | | | Block Island | 29, 30, 31 | 3.20 | |
| Franklin | 26 | 4.08 | 7.90 | *Texas.* | | | |
| Port Eads | 27 | 3.81 | 7.35 | Brownsville | 23, 24 | 6.56 | 15.71 |
| Whiteville | 26 | 5.31 | 6.70 | Do | 27, 28 | 4.88 | |
| New Iberia | 26 | 5.81 | 6.55 | Indianola | 25, 26 | 3.56 | 7.94 |
| Point a la Hache | 26 | 2.30 | 6.30 | Galveston | 25, 26 | 5.16 | 7.37 |
| Luling | 26, 27, 28 | 4.59 | 6.26 | Fort Stockton | 22 to 25 | 4.60 | 6.25 |
| Thibodeaux | 26 | 3.24 | 6.12 | Fort Concho | 24, 25 | 3.30 | |
| Grand Coteau | 25, 26 | 3.50 | | El Paso | 23, 24 | 2.11 | |
| Lafayette | 26 | 3.45 | | *Vermont.* | | | |
| Cheneyville | 26 | 2.95 | | Dorset | 3, 4 | 3.15 | |
| Amite City | 26 | 3.01 | | Lunenburg | 3, 4 | 2.55 | |
| Do | 28 | 2.01 | | *Washington Ter.* | | | |
| Clinton | 26 | 2.82 | | Fort Canby | | | 6.24 |
| Baton Rouge | 26 | 2.30 | | *Wisconsin.* | | | |
| Opelousas | 26 | 2.33 | | Franklin | 1, 2 | 2.25 | |
| Red River Land'g | 26 | 2.10 | | Manitowoc | 1, 2 | 2.03 | |
| Alexandria | 26 | 2.39 | | | | | |

*Indiana.*—Spiceland, Henry county: monthly precipitation, 1.81, is 0.54 below the October average for the last thirty years.

Logansport, Cass county: monthly precipitation, 3.26, is 0.51 above the October average for the last twenty-five years.

Wabash, Wabash county: monthly precipitation, 3.75, is 0.47 in excess of the October average for the last nine years.

*Kansas.*—Yates Centre, Woodson county: monthly precipitation, 3.83, is 0.29 below the October average for the last four years.

Lawrence, Douglas county: monthly precipitation, 2.38, is 0.54 below the October average for the last seventeen years.

Independence, Montgomery county: monthly precipitation, 4.22, is 1.00 above the October average for the last twelve years.

Wellington, Sumner county: monthly precipitation, 2.90, is 1.05 below the October average for the last six years.

*Maine.*—Gardiner, Kennebec county: monthly precipitation, 3.14, is about three-fourths of the October average for the last forty-seven years. For the first five months of the year the precipitation was 28.62; for the second five months it was only 12.87.

*Maryland.*—Fallston, Harford county: monthly precipitation, 1.48, is 1.86 below the October average for the last fourteen years.

*Massachusetts.*—Worcester, Worcester county: monthly precipitation, 2.34, is 2.06 below the October average for the last forty-five years. The largest October precipitation for that period, 9.81, occurred in 1869; the smallest, 0.46, occurred in 1879.

*Missouri.*—Saint Louis: monthly precipitation, 1.86, is 1.19 below the normal for October.

*New Jersey.*—South Orange, Essex county: monthly precipitation, 2.90, is 0.59 below the October average for the last fifteen years.

*New York.*—North Volney, Oswego county: monthly precipitation, 3.00, is 0.61 below the October average for the last thirteen years.

Palermo, Oswego county: monthly precipitation, 2.65, is 0.95 below the October average for the last thirty-one years.

*Ohio.*—Wauseon, Fulton county: monthly precipitation, 3.01, is about the average for October for the last twelve years.

*Pennsylvania.*—Dyberry, Wayne county: monthly precipitation, 2.34, is 0.86 below the October average for the last fourteen years.

*Texas.*—New Ulm, Austin county: monthly precipitation, 1.78, is 2.77 below the October average for the last thirteen years.

*Vermont.*—Woodstock, Windsor county: monthly precipitation, 2.04, is 1.69 below the October average for the last sixteen years.

*Virginia.*—Wytheville, Wythe county: monthly precipitation, 0.86, is 2.08 below the October average for a period of twenty years.

Variety Mills, Nelson county: monthly precipitation, 0.96, is 1.81 below the October average for the last six years.

*Washington Territory.*—Bainbridge Island: monthly rainfall, 6.20, is the largest recorded in October during the last seven years.

*West Virginia.*—Helvetia, Randolph county: monthly precipitation, 2.45, is 0.83 below the October average for the last eight years.

*Wisconsin.*—Madison: monthly precipitation, 4.60, is 1.57 in excess of the October average for the last thirty-one years.

## SNOW.

East of the one hundred and second meridian the most southerly stations reporting the occurrence of snow during October, 1884, are in about 40° north latitude. At North Platte, Nebraska, and Allison, Kansas, snow fell on the 7th and 8th, respectively; and on the 23d snow fell as far southward as central Ohio and southern Pennsylvania. In the more northerly districts and in the mountain regions the dates on which snow fell during the month are quite numerous. In the several districts snow fell as follows:

*New England.*—At numerous stations throughout the northern part of the district on the 14th, 15th, 16th, 24th, 25th, 30th, and 31st; it was reported from scattering stations on the 13th, 18th, and 29th; on the summit of Mount Washington, 3d, 6th, 18th, 23d to 26th, 30th, 31st.

*Middle Atlantic states.*—At Troy, Pennsylvania, 17th; Dyberry, Pennsylvania, 18th; Chambersburg, Catawissa, Drifton, and Troy, Pennsylvania, on the 23d; Albany, New York, and Easton, Pennsylvania, 25th.

*Ohio valley.*—Columbus, Westerville, and New Athens, Ohio, 23d; Grampian Hills, Pennsylvania, 23d, 24th, 26th.

*Lower lake region.*—Of general occurrence on the 23d and 24th, and at scattering stations in western New York on the 18th and 25th.

*Upper lake region.*—Of general occurrence on the 22d, 23d and 24th, and at scattering stations on the 20th, 26th, 28th and 31st.

*Extreme northwest.*—Of general occurrence on the 20th, 21st, 26th, 27th, 28th and 31st; and at scattering stations on 22d, 29th and 30th.

*Upper Mississippi valley.*—Of general occurrence at stations north of Dubuque, Iowa, on the 22d, 23d, and 24th; and at Saint Paul, Minnesota, on the 31st.

*Missouri valley.*—At scattering stations on the 7th, 20th, 21st, 27th, and 31st.

*Northern slope.*—At numerous stations from 1st to 7th, 17th, 20th, 22d, 25th, 26th, 28th, 29th, and 31st.

*Middle slope.*—Denver, Colorado, 7th, 26th, 27th; Allison, Kansas, 8th; on the summit of Pike's Peak, Colorado, 7th, 10th, 15th, 16th, 19th, 20th, 21st, 25th, and 26th.

*Southern slope.*—Fort Stanton, New Mexico, 26th.

*Middle plateau.*—Fort Bidwell, California, 1st; Fort Bridger, Wyoming, 3d, 4th, 7th; Fort Thornburg, Utah, 31st.

*Northern plateau.*—Lake View, Oregon, 1st; Fort Klamath and Linkville, Oregon, 13th.

*Middle Pacific coast region.*—Red Bluff, California, 15th, on mountains east of station.

## MONTHLY SNOW-FALLS.

[*Expressed in inches and tenths.*]

The following stations report monthly snowfalls of two inches or more:

*Colorado.*—Pike's Peak, 9.2.

*California.*—Summit, 21.0; Cisco, 13.0; Emigrant Gap, 6.0; Truckee, 4.0; Boca, 2.0.

*Dakota.*—Fort Buford, 3.3; Fort Totten, 2.5.

*Maine.*—Cornish, 4.0.

*Massachusetts.*—Rowe, 4.3.

*Michigan.*—Northport, 3.8; Traverse City, 3.0.

*Montana.*—Fort Shaw, 3.5; Fort Maginnis, 2.7; Fort Assinaboine, 2.1.

*New Hampshire.*—Mount Washington, 9.1; Antrim, 2.0.

*New York.*—Penn Yan, 3.0; North Volney, 2.2; Palermo, 2.0.

*Nevada.*—Otego, 4.0; Halleck, 3.0; Battle Mountain and Palisade, 2.0.

## SLEET.

Fort Totten, Dakota, 28th.
Webster and Huron, Dakota, 20th.
Yankton, Dakota, 7th.
Boisé City, Idaho, 13th.
Worcester, Massachusetts, 31st.
Alpena, Michigan, 22d.
Escanaba, Michigan, 24th.
Grand Haven, Michigan, 22d, 23d, 24th.
Mount Washington, New Hampshire, 13th, 17th, 22d, 23d, 27th.
Oswego, New York, 23d, 25th.
La Crosse, Wisconsin, 31st.

### HAIL.

Hail has been reported from the several states and territories, as follows:

*Arizona.*—Fort Apache, 6th; Prescott, 10th.
*Connecticut.*—Bethel, 18th; North Colebrook, 31st.
*Dakota.*—Fort Randall, 21st; Deadwood, 31st.
*Iowa.*—Guttenberg, 16th.
*Maine.*—Bangor, 3d; Portland and Eastport, 25th.
*Massachusetts.*—Heath, 12th; Taunton and Westborough, 16th; Worcester, 18th.
*Michigan.*—Lansing, Northport, and Port Huron, 22d.
*Nebraska.*—Crete, 3d; Genoa, 6th.
*New York.*—Auburn, Palermo, and Syracuse, 18th, 23d; Rochester, 23d.
*Ohio.*—North Lewisburg, 16th.
*Pennsylvania.*—Erie, 22d.
*Utah.*—Fort Thornburg, 14th.
*Vermont.*—Woodstock, 18th.
*Washington Territory.*—Fort Canby and Olympia, 31st.

## COTTON REGION REPORTS.

In the table below are given the average precipitation and the means of the maximum and minimum temperatures for October, 1884, with the October averages for the two preceding years, in the several cotton growing districts. The reports from the district of Galveston are missing.

*Temperature and rainfall data for the cotton districts, October, 1884.*

| Districts. | Rainfall. | | | Temperature. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Maximum. | | | Minimum. | | | Extremes for Oct., 1884. | |
| | Average for Oct. of two preceding years. | Average for Oct., 1884. | Departures. | Mean for Oct. of two preceding years. | Mean for Oct., 1884. | Departures. | Mean for Oct. of two preceding years. | Mean for Oct., 1884. | Departures. | Max. | Min. |
| | | | | ° | ° | ° | ° | ° | ° | ° | ° |
| New Orleans | 2.62 | 2.93 | + 0.31 | 83.4 | 81.3 | — 2.1 | 64.0 | 59 0 | — 5.0 | 96 | 36 |
| Savannah | 2.69 | 0.47 | — 2.22 | 81.8 | 84.7 | + 2.9 | 61.6 | 59.8 | — 1.8 | 99 | 27 |
| Charleston | 2.76 | 0.16 | — 2.60 | 78.3 | 80.8 | + 2.5 | 55.5 | 56.8 | + 1.3 | 99 | 25 |
| Atlanta | 2.26 | 0.46 | — 1.80 | 76.2 | 81.2 | + 5.0 | 56.5 | 55.9 | — 0.6 | 99 | 25 |
| Wilmington | 2.70 | 0.64 | — 2.06 | 75.4 | 79.8 | + 4.4 | 54.3 | 55.1 | + 0.8 | 97 | 29 |
| Memphis | 3.12 | 2.25 | — 0.87 | 77.3 | 78.2 | + 0.9 | 54.6 | 54.4 | — 0.2 | 96 | 25 |
| Galveston | 4.14 | | | 83.1 | | | 61.9 | | | | |
| Vicksburg | 4.68 | 1.40 | — 3.28 | 80.4 | 81.3 | + 0.9 | 59.2 | 57.6 | — 1.6 | 94 | 28 |
| Montgomery | 1.77 | 1.19 | — 0.58 | 81.0 | 83.4 | + 2.4 | 58.2 | 57.2 | — 1.0 | 99 | 30 |
| Augusta | 2.10 | 0.34 | — 1.76 | 78.0 | 82.6 | + 4.6 | 56.7 | 56.9 | + 0.2 | 104 | 24 |
| Little Rock | 3.06 | 0.99 | — 2.07 | 77.7 | 77.3 | — 0.4 | 52.2 | 53.0 | + 0.8 | 95 | 23 |
| Mobile | 2.36 | 1.72 | — 0.64 | 82.0 | 82.1 | + 0.1 | 59.0 | 57.4 | — 1.6 | 98 | 27 |

## WINDS.

The most frequent directions of the wind during October, 1884, are shown on chart ii. by arrows flying with the wind. In the lower Missouri and upper Mississippi valleys, the lake region, southern New England, and in the upper Ohio valley the prevailing directions of the winds were generally from southeast to southwest; in the south Atlantic and Gulf states, Tennessee, the upper Missouri valley, and on the coast of Maine they were from northeast to northwest; in the west Gulf states, middle and southern slopes they were from east to south; in the north Pacific coast region they were southerly; in California they were northerly at Red Bluff and Sacramento and westerly at the coast stations.

### HIGH WINDS.

On the summit of Mount Washington, New Hampshire, the following velocities of fifty or more miles per hour were recorded: 70, n. and w., 1st; 60, n., 2d; 65, w., 4th; 65, nw., 6th; 70, nw., 7th; 68, nw., 9th; 55, nw., 10th; 75, nw., 11th and 12th; 80, nw., 13th; 60, nw., 14th; 72, nw., 15th; 64, w., 17th; 88, nw., 19th; 92, nw., 20th (maximum for month); 76, nw., 21st; 88, sw., 22d; 60, nw., 25th; 64, nw., 26th; 90, nw., 27th; 68, nw., 28th; 60, nw., 29th.

On the summit of Pike's Peak, Colorado, the following high velocities were recorded: 52, w., 4th; 68, w., 5th (maximum for month); 54, sw., 6th; 60, w., 31st.

Other stations reporting velocities of fifty or more miles per hour are as follows:

Fort Canby, Washington Territory, 56, s., 8th and 10th.
Cape Mendocino, California, 68, s., 12th; 64, s., 13th.
Fort Assinaboine, Montana, 60, sw., 13th.
Sandy Hook, New Jersey, 52, nw., 18th.
Delaware Breakwater, Delaware, 51, ne., 15th.

### LOCAL STORMS AND TORNADOES.

Mannville, Sumter county, South Carolina.—A severe hail-storm occurred in this vicinity at about 8 p. m. on the 9th; the hail-stones were very large and caused considerable damage to the cotton crop.

Harrisburg, Pennsylvania.—The most destructive storm of the season occurred on the evening of the 8th; it came from the northwest, the width of its path being not more than one-half mile. Trees were blown down and several houses unroofed. In one instance the roof of a building was blown across the Susquehanna river. The duration of the storm was not more than ten minutes. On the afternoon of the 12th, a severe hail and wind storm occurred. The hail-stones are reported to have been about as large as marbles of ordinary size, and fell to a depth almost sufficient to cover the ground. The high wind caused considerable damage in the upper part of the city. The rainfall was very heavy and many cellars were flooded.

The following extract is from the "Toledo (Ohio) Evening Bee," of October 11th:

FINDLAY, O., October 11.—News has just reached here of a cyclone which passed through Van Buren township and the southern part of this county, from east to west, devastating everything in its way. The track of the cyclone is said to have been about ten rods wide, and forests, buildings, fences, corn shocks, and everything in its course, were torn to pieces and scattered far and wide. The storm-cloud was in the shape of an inverted cone, and traveled at the rate of about sixty miles an hour. After it passed, the entire township could have been crossed without laying down a fence, but, although the damage was great, there were no lives lost.

Portland, Maine.—Threatening weather and brisk wind prevailed during the morning of the 13th, the wind reaching a velocity of twenty-four miles per hour, at 11.25 o'clock. A tornado is reported to have occurred north of this place, the width of its path being very narrow. At Lewiston the storm caused damage estimated at $5,000.

The following extract is from "Science" of November 21, 1884:

The Norwegian bark "Loveid," recently arrived in Philadelphia, reports a very peculiar squall experienced October 18th in latitude 39° 49′ north, longitude 69° 5′ west. During fine, clear weather, with a light breeze from the northwest, heavy banks of clouds of most threatening aspect suddenly appeared, driving in every direction. Almost immediately a heavy squall of wind and rain struck the vessel, the wind shifting quickly all around the compass. In the midst of this disturbance, which lasted about an hour, a single peal of thunder was heard, and simultaneously a bolt of lightning struck the fore royal masthead and ran down the mast to the royal yard, which was almost destroyed. The lightning, which looked like a ball of fire, then ran out on the horn of the cross-trees and "burst" with a loud report, scattering sparks all over the vessel. The barometer fell suddenly from 30.00 to 28.60, and then rose as rapidly, the weather becoming pleasant immediately afterwards. This was rather a peculiar squall, considering the locality and the season.

## NAVIGATION.

### FLOODS.

Scott's Hill, North Carolina: the heavy rains of the 11th, 12th, and 13th caused the streams in the surrounding country to rise rapidly, and several bridges are reported to have been washed away.

Rio Grande City, Texas: heavy rains caused the Rio Grande river to rise rapidly during the 24th; at 3 p. m. it began to overflow, and by 5 p. m. the low lands south of the city were covered to a depth of four feet. On the afternoon of the 25th the river was falling slowly, after having reached a height twelve feet above low-water mark.

Fort Stockton, Texas: rains fell daily from the 21st to 28th; on the afternoon of the 24th two adobe houses were washed away and several others were rendered unsafe.

## STAGE OF WATER IN RIVERS.

In the following table are shown the danger points at the various river stations, the highest and lowest stages for October, 1884, with the dates of occurrence and the monthly ranges:

*Heights of rivers above low-water mark, October, 1884.*

| Stations. | Danger-point on gauge. | Highest water. | | Lowest water. | | Monthly range. |
|---|---|---|---|---|---|---|
| | | Date. | Height. | Date. | Height. | |
| *Red River:* | Ft. In. | | Ft. In. | | Ft. In. | Ft. In. |
| Shreveport, Louisiana | 29 9 | 5, 6, 7 | 2 1 | 27, 28, 29 | 0 2 | 1 11 |
| *Arkansas:* | | | | | | |
| Little Rock, Arkansas | 33 0 | 8 | 12 4 | 26 | 3 5 | 8 11 |
| Fort Smith, Arkansas | | 5 | 5 3 | 22 | *—3 10 | 9 1 |
| *Missouri:* | | | | | | |
| Yankton, Dakota | 20 0 | 2, 3, 4 | 10 9 | 31 | 8 3 | 2 6 |
| Omaha, Nebraska | 16 0 | 4, 5 | 8 0 | 23, 24 | 6 10 | 1 2 |
| Leavenworth, Kansas | 21 0 | 13 | 18 0 | 1 | 5 1 | 12 11 |
| *Mississippi:* | | | | | | |
| Saint Paul, Minnesota | 14 6 | 10 | 6 6 | 1 | 3 10 | 2 8 |
| La Crosse, Wisconsin | 18 0 | 10, 11 | 8 9 | 28, 29, 30 | 5 1 | 3 8 |
| Dubuque, Iowa | 21 10 | 16 | 14 7 | 31 | 9 1 | 5 6 |
| Davenport, Iowa | 15 0 | 11, 19 | 11 4 | 31 | 7 6 | 3 10 |
| Keokuk, Iowa | 14 0 | 9 | 13 4 | 31 | 8 10 | 4 6 |
| Saint Louis, Missouri | 30 0 | 2 | 22 3 | 31 | 17 5 | 4 10 |
| Cairo, Illinois | 40 0 | 5 | 19 8 | 25 | 15 9 | 3 11 |
| Memphis, Tennessee | 34 0 | 7 | 14 1 | 1 | 5 9 | 8 4 |
| Vicksburg, Mississippi | 41 0 | 13 | 18 0 | 1 | 5 1 | 12 11 |
| New Orleans, Louisiana† | —2 6 | 14, 15, 16 | —10 7 | 7 | —12 6 | 1 11 |
| *Ohio:* | | 27 | | | | |
| Pittsburg, Pennsylvania | 20 0 | 5 | 6 7 | 26 | 0 3 | 6 4 |
| Cincinnati, Ohio | 50 0 | 14 | 5 1 | 31 | 2 11 | 2 2 |
| Louisville, Kentucky | 24 0 | 3, 4 | 3 11 | 9 to 12, 15 | 2 7 | 1 4 |
| *Cumberland:* | | | | | | |
| Nashville, Tennessee | 42 0 | 31 | 1 4 | 25, 26, 27 | *—0 2 | 1 6 |
| *Tennessee:* | | | | | | |
| Chattanooga, Tennessee | 33 0 | 31 | 1 1 | 19, 20, 21 | 0 2 | 0 11 |
| *Monongahela:* | | | | | | |
| Pittsburg, Pennsylvania | 29 0 | 5 | 6 7 | 26 | 0 3 | 6 4 |
| *Savannah:* | | | | | | |
| Augusta, Georgia | | 13 | 5 7 | 15 | 4 1 | 1 6 |
| *Willamette:* | | | | | | |
| Portland, Oregon | | 13 | 5 0 | 1 | 0 11 | 4 1 |
| *Sacramento:* | | | | | | |
| Red Bluff, California | | 15 | 1 6 | 1 to 12 | 0 10 | 0 8 |
| Sacramento, California | | 15 | 10 1 | 1, 2 | 7 9 | 2 4 |
| *Mobile:* | | | | | | |
| Mobile, Alabama | | 27 | 18 2 | 9 | 15 7 | 2 7 |
| *Colorado:* | | | | | | |
| Yuma, Arizona | | | | | | |

* Below bench mark. † Below high-water mark of 1874 and 1883.

At Nashville, Tennessee, the Cumberland river was not navigable at any time during the month; on the 25th, 26th, and 27th, the river was two inches below the low-water mark of September 5, 1863.

The Tennessee river at Chattanooga was navigable for small steamers at the close of the month.

## HIGH TIDES.

Eastport, Maine, 6th.
New River Inlet, North Carolina, 10th, 11th, 17th.
Jacksonville, Florida, 14th, 15th.
Indianola, Texas, 1st to 6th, 23d, 24th.
Scott's Hill, North Carolina, 11th, 13th, 23d.

## VERIFICATIONS.

### INDICATIONS.

The detailed comparison of the tri-daily indications for October, 1884, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 82.14 per cent. The percentages for the four elements are: Weather, 87.23; direction of the wind, 80.58; temperature, 78.61; barometer, 80.64 per cent. By geographical districts, they are: For New England, 83.03; middle Atlantic states, 85.77; south Atlantic states, 87.24; eastern Gulf states, 87.32; western Gulf states, 86.27; lower lake region, 79.08; upper lake region, 80.52; Ohio valley and Tennessee, 81.40; upper Mississippi valley, 77.98; Missouri valley, 73.34; north Pacific coast region, 80.53; middle Pacific coast region, 89.17; south Pacific coast region, 86.67. There were sixteen omissions to predict out of 3,211, or 0.50 per cent. Of the 3,195 predictions that have been made, one hundred and twenty-six, or 3.94 per cent., are considered to have entirely failed; one hundred and fifty-five, or 4.85 per cent., were one-fourth verified; three hundred and eighty-one, or 11.93 per cent., were one-half verified; five hundred and fifty-two, or 17.28 per cent., were three-fourths verified; 1,981, or 62.00 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

Professor T. C. Mendenhall, director of the Ohio Meteorological Bureau, reports as follows: The percentage of verification of railway signals for the month was, 91 for temperature and 87 for rain.

### CAUTIONARY SIGNALS.

During October, 1884, two hundred and five cautionary signals were ordered. Of these, one hundred and forty-nine or 72.2 per cent., were justified by winds of twenty-five miles or more per hour at or within one hundred miles of the station. Forty-two cautionary off-shore signals were ordered, of which number thirty-three, or 78.6 per cent., were fully justified, both as to direction and velocity; thirty-seven, or 88.1 per cent., were justified as to direction; and thirty-nine, or 92.9 per cent., were justified as to velocity. Forty-one cautionary northwest signals were ordered at the lake ports, of which, twenty, or 48.8 per cent. were justified both as to direction and velocity; thirty-three, or 80.5 per cent. were justified as to direction only, and twenty-three, or 56.1 per cent. were justified as to velocity only. Of the forty-two cautionary off-shore signals that were ordered, twenty were changed from cautionary displays, and of the forty-one northwest signals ordered, all but four were changed from cautionary displays. Two hundred and eighty-eight signals of all kinds were ordered, two hundred and two, or 70.1 per cent., being fully justified. These do not include signals ordered at display stations where the velocity of the wind is only estimated. Eleven signals were ordered late. In one hundred cases winds of twenty-five miles or more per hour were reported, for which no signals were ordered.

## TEMPERATURE OF WATER.

The following table shows the highest and lowest temperatures of the water at the several stations; the monthly range of water temperature; the average depth at which the observations were made; and the mean temperature of the air at the stations:

*Temperature of water for October, 1884.*

| Station. | Temperature at bottom. | | Range. | Average depth, feet and inches. | Mean temperature of the air at station. |
|---|---|---|---|---|---|
| | Max. | Min. | | | |
| | ° | ° | ° | ft. in. | ° |
| Atlantic City, New Jersey | 72.3 | 57.0 | 15.3 | 2 1 | 58.5 |
| Alpena, Michigan | 58.0 | 39.0 | 19.0 | 11 11 | 48.3 |
| Augusta, Georgia | 84.6 | 64.5 | 20.1 | 4 7 | 70.6 |
| Baltimore, Maryland | 73.0 | 59.8 | 13.2 | 9 11 | 60.2 |
| Block Island, Rhode Island | 65.5 | 51.1 | 14.4 | 7 2 | 54.9 |
| Boston, Massachusetts | 62.2 | 48.3 | 13.9 | 21 0 | 52.3 |
| Buffalo, New York | 68.0 | 50.2 | 17.8 | 10 0 | 52.0 |
| Canby, Fort, Washington Territory | 56.7 | 51.7 | 5.0 | 17 8 | 52.5 |
| Cedar Keys, Florida | 81.6 | 69.8 | 11.8 | 10 8 | 74.3 |
| Charleston, South Carolina | 82.0 | 66.9 | 15.1 | 40 6 | 71.2 |
| Chicago, Illinois | 62.7 | 48.4 | 14.3 | 7 11 | 56 4 |
| Chincoteague, Virginia | 79.2 | 44.0 | 35.2 | 4 0 | 62.4 |
| Cleveland, Ohio* | 69.5 | 51.7 | 17.8 | 14 0 | 55.7 |
| Detroit, Michigan | 66.0 | 47.6 | 19.0 | 24 1 | 56.3 |
| Delaware Breakwater, Delaware | 75.5 | 59.7 | 15.8 | 8 3 | 61.1 |
| Duluth, Minnesota | 51.5 | 41.9 | 9.6 | 10 3 | 46.7 |
| Eastport, Maine | 51.5 | 47.7 | 3.8 | 15 0 | 45.4 |
| Escanaba, Michigan | 59.8 | 46.6 | 13.2 | 17 10 | 47.5 |
| Galveston, Texas | 83.5 | 65.5 | 18.0 | 13 0 | 74.8 |
| Grand Haven, Michigan | 67.4 | 45.4 | 22.0 | 19 0 | 54.1 |
| Indianola, Texas | 84.2 | 62.4 | 21.8 | 9 5 | 74.0 |
| Jacksonville, Florida | 83.2 | 70.0 | 13.2 | 18 0 | 72.8 |
| Key West, Florida | 83.7 | 76.6 | 7.1 | 17 5 | 78.3 |
| Mackinaw City, Michigan | 59.8 | 46.5 | 13.3 | 10 0 | 48.8 |
| Macon, Fort, North Carolina | 82.0 | 64.2 | 17.8 | 6 11 | 67.7 |
| Marquette, Michigan | 55.5 | 42.7 | 12.8 | 10 0 | 47.5 |
| Milwaukee, Wisconsin | 55.2 | 47.7 | 7.5 | 8 0 | 53.3 |
| Mobile, Alabama | 84.4 | 69.5 | 14.9 | 16 9 | 72.2 |
| New Haven, Connecticut | 70.0 | 50.0 | 20.0 | 15 5 | 53.2 |
| New London, Connecticut | 66.0 | 52.6 | 13.4 | 11 9 | 54.6 |
| New York City | 69.2 | 53.0 | 16.2 | 15 10 | 56.1 |
| Norfolk, Virginia | 78.2 | 53.8 | 24.4 | 10 6 | 64.6 |
| Pensacola, Florida | 84.8 | 67.1 | 17.7 | 17 7 | 73.8 |
| Portland, Maine | 56.7 | 47.6 | 9.1 | 16 0 | 50.6 |
| Portland, Oregon | 57.5 | 49.7 | 7.8 | 52 8 | 51.2 |
| Sandusky, Ohio | 71.0 | 47.0 | 24.0 | 10 0 | 56.6 |
| Sandy Hook, New Jersey | 71.4 | 51.8 | 19.6 | 1 10 | 57.2 |
| San Francisco, California | 57.4 | 54.8 | 2.6 | 34 7 | 56.9 |
| Savannah, Georgia | 82.6 | 66.2 | 16.4 | 10 6 | 70.6 |
| Smithville, North Carolina | 81.5 | 65.8 | 15.7 | 10 9 | 68.0 |
| Toledo, Ohio | 69.7 | 47.5 | 22.2 | 10 10 | 56.3 |
| Wilmington, North Carolina | 80.0 | 66.0 | 14.0 | 18 9 | 68.5 |

* Record for twenty-eight days.

*Table of miscellaneous meteorological data for October, 1884—Signal Service observations.*

| Stations. | Elevation above sea-level. | Atmospheric pressure. | | | | | | | | Temperature of the air (in degrees Fahrenheit). | | | | | | | | | | | | Mean rel. humidity. | Mean dew-point. | Precipitation. | Departure from normal | Winds. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean actual barometer. | Departure from normal. | Mean reduced barometer. | Extremes. | | | | Monthly range of barometer. | Monthly mean. | Departure from normal. | Extremes. | | | | | | Daily ranges. | | | | | | | | Total movement. | Prevailing direction. | Max. velocity. | | Date. | No. of rainy days. | No. of cloudy days. | No. of fair days. | No. of clear days. |
| | | | | | Highest barometer | Date. | Lowest barometer | Date. | | | | Max. | Date. | Mean max | Min. | Date. | Mean min | Monthly range | Greatest. | Date. | Least. | Date. | | | | | | | Miles p.hr | Direction. | | | | | |
| *New England.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Block Island | 27 | 30.08 | ..... | 30.11 | 30.59 | 26 | 29.68 | 17 | 0.91 | 54.9 | —0.5 | 73 | 5 | 160.8 | 32.6 | 26 | 48.6 | 40.9 | 26.8 | 27 | 1.7 | 3 | 77.9 | 47.8 | 3.89 | —1.40 | 11,494 | sw. | 44 | ne. | 31 | 11 | 11 | 13 | 8 |
| Boston | 122 | 29.96 | .00 | 30.10 | 30.59 | 26 | 29.65 | 17 | 0.94 | 52.3 | 0 | 83.3 | | 161.5 | 30.6 | 26 | 43.8 | 52.7 | 31.1 | 4 | 6.6 | 30 | 67.3 | 40.8 | 3.17 | —1.08 | 9,288 | sw. | 35 | sw. | 22 | 13 | 10 | 11 | 10 |
| Eastport | 61 | 29.95 | —.05 | 30.02 | 30.57 | 26 | 29.50 | 17 | 1.07 | 45.4 | —2.0 | 67.9 | | 151.9 | 27.4 | 16 | 39.3 | 40.5 | 18.6 | 16 | 4.3 | 30 | 74.2 | 37.3 | 1.88 | —2.92 | 7,599 | nw. | 34 | ne. | 31 | 12 | 11 | 12 | 8 |
| Mount Washington* | 6,279 | 23.73 | ..... | 30.07 | 30.44 | 26 | 29.69 | 17 | 0.75 | 28.4 | —2.1 | 56.4 | | 436.2 | 43.0 | 26 | 20.9 | 52.1 | 31.4 | 13 | 4.8 | 12 | 92.5 | 26.3 | 12.91 | +5.98 | 25,475 | nw. | 92 | nw. | 20 | 22 | 6 | 15 | 10 |
| New Haven | 107 | 30.00 | ..... | 30.12 | 30.57 | ... | 29.72 | 17 | 0.80 | 53.2 | —0.7 | 81.3 | | 462.5 | 26.5 | 26 | 43.9 | 54.8 | 29.3 | 6 | 5.0 | 30 | 72.7 | 43.8 | 2.49 | —1.36 | 5,737 | sw. | 26 | w. | 18 | 8 | 8 | 11 | 12 |
| New London | 47 | 30.08 | +.01 | 30.14 | 30.58 | 26 | 29.71 | 17 | 0.87 | 54.6 | —0.3 | 79.2 | | 162.6 | 30.6 | 26 | 46.8 | 48.6 | 25.2 | 10 | 5.4 | 30 | 84.7 | 49.8 | 3.53 | —0.77 | 5,242 | sw. | 25 | sw. | 22 | 17 | 7 | 13 | 11 |
| Portland | 45 | 30.01 | —.02 | 30.06 | 30.56 | 26 | 29.60 | 17 | 0.97 | 50.6 | 0 | 79.2 | | 158.4 | 34.6 | 26 | 43.1 | 44.6 | 39.3 | 20 | 5.9 | 31 | 69.5 | 40.2 | 2.21 | —1.14 | 6,256 | sw. | 33 | n. | 9 | 15 | 11 | 12 | 8 |
| *Middle Atlantic states.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Albany | 83 | 30.03 | —.01 | 30.12 | 30.63 | 26 | 29.65 | 8 | 0.97 | 51.3 | —0.1 | 80.1 | | 460.2 | 26.6 | 26 | 42.4 | 53.5 | 29.1 | 6 | 5.5 | 30 | 62.4 | 37.9 | 2.64 | —0.49 | 5,604 | sw. | 28 | sw. | 22 | 11 | 13 | 12 | 6 |
| Atlantic City | 130 | 30.12 | +.02 | 30.14 | 30.57 | 26 | 29.77 | 17 | 0.80 | 58.5 | +1.3 | 83.0 | | 465.8 | 32.4 | 26 | 50.8 | 50.6 | 23.0 | 10 | 5.5 | 31 | 76.0 | 50.4 | 2.94 | +0.14 | 6,644 | nw. | 25 | ne. | 2 | 10 | 6 | 12 | 13 |
| Baltimore | 45 | 30.12 | +.02 | 30.17 | 30.62 | 26 | 29.75 | 8 | 0.87 | 60.2 | +2.1 | 88.7 | | 669.2 | 35.4 | 26 | 52.3 | 53.3 | 28.4 | 11 | 2.9 | 30 | 63.8 | 46.5 | 1.42 | —1.55 | 3,905 | n. | 20 | sw. | 22 | 10 | 8 | 17 | 16 |
| Barnegat City | 22 | 30.12 | +.02 | 30.14 | 30.59 | 26 | 29.75 | 8 | 0.84 | 58.3 | +1.9 | 81.1 | | 466.7 | 32.6 | 26 | 50.8 | 48.5 | 23.0 | 20 | 6.1 | 29 | 81.0 | 52.1 | 2.19 | —1.39 | 10,371 | sw. | 36 | nw. | 18 | 13 | 7 | 13 | 11 |
| Cape Henry | 16 | 30.14 | +.04 | 30.16 | 30.60 | 26 | 29.79 | 8 | 0.80 | 64.9 | +1.8 | 80.6 | | 572.8 | 39.2 | 25 | 58.4 | 46.8 | 24.1 | 17 | 6.1 | 29 | 73.0 | 54.9 | 0.74 | —3.51 | 9,722 | n. | 40 | nw. | 23 | 5 | 3 | 10 | 18 |
| Cape May | 27 | 30.12 | ..... | 30.15 | 30.60 | 26 | 29.78 | 8 | 0.82 | 60.3 | +1.3 | 85.7 | | 166.8 | 36.0 | 26 | 53.1 | 49.7 | 23.5 | 9 | 5.8 | 3 | 75.9 | 52.3 | 1.33 | —2.20 | 11,618 | s. | 48 | nw. | 23 | 9 | 4 | 13 | 14 |
| Chincoteague | 8 | 30.14 | +.03 | 30.16 | 30.59 | 26 | 29.79 | 8 | 0.80 | 62.4 | +1.4 | 84.2 | | 470.4 | 36.5 | 26 | 54.4 | 47.7 | 23.0 | 14 | 7.0 | 3 | 77.2 | 54.6 | 1.12 | —2.50 | 7,399 | n.w. | 33 | ne. | 15 | 7 | 4 | 13 | 14 |
| Delaware Breakwater | 20 | 30.13 | +.03 | 30.15 | 30.62 | 26 | 29.76 | 8 | 0.86 | 61.1 | +0.4 | 83.3 | | 667.9 | 34.5 | 16 | 54.7 | 48.8 | 20.9 | 16 | 3.5 | 3 | 72.5 | 51.1 | 1.12 | —1.95 | 10,697 | sw. | 51 | ne. | 15 | 7 | 2 | 14 | 15 |
| Lynchburg | 652 | 29.48 | +.04 | 30.17 | 30.57 | 26 | 29.82 | 8 | 0.75 | 62.6 | +4.2 | 91.3 | | 674.1 | 32.7 | 26 | 52.8 | 58.6 | 35.7 | 16 | 6.2 | 30 | 63.1 | 47.7 | 0.54 | —2.49 | 2,098 | nw. | 20 | nw. | 18 | 5 | 6 | 8 | 17 |
| New York | 164 | 29.97 | +.01 | 30.15 | 30.60 | 26 | 29.74 | 8 | 0.85 | 56.1 | —0.5 | 84.5 | | 165.3 | 32.5 | 26 | 48.8 | 52.0 | 23.0 | 4 | 3.6 | 3 | 69.8 | 45.3 | 3.63 | +0.51 | 8,644 | w. | 44 | w. | 18 | 10 | 7 | 12 | 12 |
| Norfolk | 30 | 30.15 | +.06 | 30.18 | 30.56 | 26 | 29.85 | 8 | 0.70 | 64.6 | +3.5 | 89.0 | | 573.2 | 39.2 | 25 | 56.8 | 49.8 | 24.5 | 17 | 6.7 | 31 | 72.4 | 54.7 | 0.47 | —3.49 | 5,023 | ne. | 26 | n. | 15 | 4 | 1 | 13 | 17 |
| Philadelphia | 117 | 30.04 | +.02 | 30.17 | 30.61 | 26 | 29.78 | 8 | 0.82 | 57.2 | +0.9 | 83.7 | | 467.5 | 31.7 | 26 | 48.8 | 52.0 | 27.7 | 11 | 8.1 | 31 | 67.8 | 45.6 | 1.54 | —1.43 | 7,173 | n. | 33 | s. | 26 | 12 | 7 | 12 | 12 |
| Sandy Hook | 28 | 30.12 | +.01 | 30.15 | 30.60 | 26 | 29.74 | 8 | 0.86 | 57.2 | +0.2 | 81.1 | | 165.5 | 35.1 | 26 | 49.9 | 46.0 | 25.8 | 20 | 4.3 | 31 | 69.9 | 46.8 | 4.21 | +0.88 | 12,831 | nw. | 52 | nw. | 18 | 13 | 7 | 10 | 14 |
| Washington City | 106 | 30.06 | +.03 | 30.18 | 30.64 | 26 | 29.76 | 8 | 0.88 | 59.6 | +2.5 | 90.2 | | 470.4 | 31.7 | 26 | 50.4 | 58.5 | 31.7 | 11 | 4.2 | 30 | 68.3 | 47.6 | 1.73 | —1.27 | 3,990 | n. | 23 | s. | 26 | 7 | 5 | 15 | 11 |
| *South Atlantic states.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Atlanta | 1,129 | 29.00 | +.05 | 30.19 | 30.49 | 20 | 29.96 | 8 | 0.52 | 67.8 | +4.2 | 90.8 | | 377.1 | 33.6 | 24 | 58.9 | 57.2 | 24.8 | 16 | 8.8 | 28 | 63.1 | 53.5 | 0.70 | —2.66 | 6,442 | e. | 24 | nw. | 23 | 4 | 3 | 7 | 21 |
| Augusta | 183 | 29.99 | +.06 | 30.18 | 30.50 | 20 | 29.90 | 9 | 0.60 | 70.6 | +5.8 | 93.5 | | 681.3 | 38.0 | 25 | 60.9 | 55.5 | 32.1 | 26 | 12.2 | 10 | 60.5 | 57.2 | 0.83 | —1.39 | 2,319 | ne. | 16 | ne. | 15 | 3 | 2 | 7 | 22 |
| Charleston | 52 | 30.07 | +.02 | 30.13 | 30.47 | 20 | 29.91 | 30 | 0.56 | 71.2 | +4.0 | 91.4 | | 677.9 | 45.2 | 24 | 65.3 | 46.2 | 20.8 | 17 | 6.3 | 10 | 77.1 | 62.9 | 0.35 | —4.65 | 5,401 | e. | 24 | ne. | 15 | 6 | 3 | 12 | 16 |
| Charlotte | 808 | 29.33 | +.06 | 30.19 | 30.54 | 20 | 29.92 | 8 | 0.62 | 66.4 | +4.3 | 91.9 | | 570.4 | 36.0 | 24 | 56.0 | 55.9 | 27.2 | 10 | 12.2 | 10 | 63.1 | 51.9 | 1.51 | —2.09 | 3,254 | n. | 10 | n. | 15 | 4 | 5 | 9 | 17 |
| Fort Macon | 11 | 30.15 | +.06 | 30.16 | 30.54 | 20 | 29.89 | 30 | 0.64 | 67.7 | +0.2 | 83.9 | | 673.0 | 43.8 | 24 | 61.9 | 40.1 | 17.9 | 23 | 4.9 | 30 | 77.2 | 59.8 | 0.34 | —1.72 | 9,224 | ne. | 40 | ne. | 14 | 4 | 5 | 7 | 19 |
| Hatteras | 12 | 30.13 | +.04 | 30.14 | 30.56 | 20 | 29.85 | 30 | 0.70 | 67.4 | +2.1 | 83.2 | | 673.0 | 47.0 | 25 | 62.3 | 36.2 | 17.2 | 8 | 5.0 | 30 | 78.7 | 60.1 | 1.23 | —6.03 | 6,610 | ne. | 32 | nw. | 24 | 5 | 4 | 11 | 16 |
| Jacksonville | 43 | 30.00 | +.03 | 30.10 | 30.37 | 20 | 29.89 | 30 | 0.48 | 72.8 | +2.4 | 91.7 | | 780.6 | 49.4 | 25 | 65.6 | 42.3 | 21.3 | 17 | 8.0 | 21 | 78.1 | 64.9 | 4.12 | —2.48 | 4,969 | ne. | 22 | n. | 14 | 9 | 5 | 13 | 13 |
| Kitty Hawk | 22 | 30.14 | +.03 | 30.16 | 30.57 | 26 | 29.86 | 18 | 0.70 | 66.8 | +3.0 | 86.0 | | 473.8 | 42.1 | 25 | 59.8 | 43.9 | 22.8 | 17 | 4.3 | 3 | 76.2 | 58.3 | 1.23 | —3.30 | 10,278 | ne. | 47 | ne. | 15 | 4 | 2 | 10 | 13 |
| Savannah | 87 | 30.05 | +.04 | 30.14 | 30.44 | 20 | 29.92 | 9 | 0.52 | 70.6 | +3.6 | 92.0 | | 778.3 | 44.5 | 24 | 63.3 | 47.5 | 23.0 | 17 | 8.3 | 10 | 73.1 | 60.6 | 2.29 | —1.51 | 4,978 | ne. | 20 | ne. | 10 | 5 | 2 | 8 | 21 |
| Smithville | 34 | 30.12 | +.04 | 30.16 | 30.53 | 20 | 29.91 | 30 | 0.62 | 68.0 | +2.2 | 86.5 | | 674.8 | 36.9 | 24 | 59.7 | 49.6 | 25.7 | 10 | 5.2 | 30 | 76.4 | 59.8 | 0.23 | —5.66 | 5,993 | e. | 24 | ne. | 27 | 3 | 3 | 5 | 23 |
| Wilmington | 52 | 30.10 | +.04 | 30.15 | 30.52 | 20 | 29.89 | 30 | 0.62 | 68.5 | +4.2 | 92.5 | | 677.8 | 40.7 | 24 | 59.7 | 51.8 | 27.4 | 25 | 5.3 | 30 | 73.0 | 58.7 | 0.63 | —3.37 | 3,370 | ne. | 19 | ne. | 15 | 3 | 4 | 12 | 15 |
| *Eastern Gulf states.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mobile | 35 | 30.08 | +.06 | 30.12 | 30.39 | 24 | 29.92 | 9 | 0.47 | 72.2 | +4.2 | 93.4 | | 882.5 | 43.7 | 24 | 63.6 | 49.7 | 30.1 | 25 | 7.7 | 27 | 71.5 | 61.1 | 5.36 | +1.93 | 4,310 | n. | 29 | se. | 27 | 6 | 3 | 6 | 22 |
| Montgomery | 219 | 29.90 | +.04 | 30.13 | 30.41 | 25 | 29.91 | 8 | 0.50 | 71.5 | +5.4 | 96.1 | | 783.0 | 40.0 | 24 | 61.3 | 56.1 | 33.9 | 17 | 10.8 | 28 | 60.9 | 54.9 | 1.87 | —0.78 | 3,043 | ne. | 20 | se. | 27 | 4 | 5 | 4 | 22 |
| New Orleans | 52 | 30.02 | +.04 | 30.08 | 30.34 | 24 | 29.94 | 8 | 0.41 | 74.4 | +3.8 | 90.0 | | 880.3 | 49.0 | 24 | 67.2 | 41.0 | 18.5 | 10 | 5.8 | 27 | 72.2 | 63.9 | 5.60 | +1.90 | 5,041 | e. | 23 | e. | 25 | 10 | 5 | 9 | 17 |
| Pensacola | 30 | 30.08 | +.03 | 30.10 | 30.36 | 25 | 29.91 | 8 | 0.45 | 73.8 | +2.4 | 95.2 | | 882.1 | 46.2 | 24 | 67.4 | 49.0 | 22.8 | 19 | 6.0 | 27 | 68.4 | 61.6 | 2.43 | —2.31 | 4,822 | ne. | 24 | se. | 26 | 5 | 4 | 8 | 19 |
| Vicksburg | 244 | 29.89 | +.07 | 30.15 | 30.45 | 24 | 29.94 | 26 | 0.50 | 69.3 | +3.0 | 93.7 | | 579.9 | 39.2 | 24 | 60.7 | 54.5 | 27.1 | 12 | 3.9 | 27 | 72.4 | 58.9 | 1.08 | —2.03 | 3,456 | n. | 18 | se. | 26 | 5 | 6 | 6 | 19 |
| *Western Gulf states.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fort Smith | 451 | 29.66 | +.13 | 30.14 | 30.48 | 23 | 29.90 | 26 | 0.58 | 64.3 | +3.1 | 94.6 | | 579.3 | 39.0 | 28 | 55.0 | 55.6 | 36.5 | 16 | 6.3 | 26 | 75.1 | 55.0 | 1.32 | —2.09 | 2,510 | e. | 16 | n.; nw | 8 | 3 | 4 | 13 | 14 |
| Galveston | 40 | 30.05 | +.06 | 30.09 | 30.32 | 24 | 29.92 | 26 | 0.40 | 74.8 | +2.3 | 87.2 | | 179.7 | 57.3 | 30 | 69.7 | 29.9 | 14.0 | 23 | 6.0 | 28 | 75.2 | 66.0 | 7.37 | +1.75 | 6,760 | se. | 27 | n. | 22 | 10 | 4 | 14 | 13 |
| Indianola | 26 | 30.05 | +.05 | 30.08 | 30.30 | 16 | 29.93 | 25 | 0.37 | 74.0 | +1.1 | 80.0 | | 179.2 | 54.0 | 29 | 68.4 | 32.0 | 18.5 | 25 | 5.3 | 4 | 80.9 | 67.4 | 7.94 | +4.33 | 8,878 | e. | 39 | n. | 8 | 10 | 2 | 13 | 16 |
| Little Rock | 299 | 29.82 | +.08 | 30.14 | 30.49 | 23 | 29.89 | 26 | 0.06 | 65.5 | —0.1 | 90.0 | | 575.8 | 35.2 | 24 | 57.2 | 50.8 | 32.0 | 8 | 9.4 | 27 | 80.6 | 58.8 | 1.30 | —2.57 | 2,559 | nw. | 20 | nw. | 8 | 4 | 4 | 9 | 18 |
| Palestine | 533 | 29.58 | +.11 | 30.14 | 30.39 | 24 | 29.95 | 26 | 0.44 | 66.8 | —0.8 | 89.1 | | 677.0 | 46.1 | 23 | 58.8 | 43.0 | 31.0 | 11 | 5.8 | 24 | 75.3 | 57.5 | 1.45 | —2.06 | 5,501 | ne. | 20 | se. | 25 | 7 | 3 | 11 | 17 |
| Shreveport | 297 | 29.90 | +.10 | 30.14 | 30.42 | 24 | 29.89 | 26 | 0.54 | 68.0 | +1.8 | 92.7 | | 679.5 | 42.5 | 24 | 59.1 | 50.2 | 31.9 | 31 | 8.1 | 28 | 72.5 | 57.3 | 0.54 | —3.38 | 3,083 | n. | 25 | nw. | 8 | 5 | 8 | 5 | 18 |
| *Ohio valley & Tennessee.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chattanooga | 783 | 29.34 | +.03 | 30.17 | 30.46 | 20 | 29.92 | 8 | 0.53 | 66.2 | +2.9 | 90.8 | | 576.8 | 34.0 | 24 | 57.5 | 56.8 | 29.6 | 16 | 4.5 | 27 | 69.6 | 54.3 | 1.83 | —1.73 | 3,427 | nw. | 24 | s. | 26 | 5 | 6 | 5 | 20 |
| Cincinnati | 620 | 29.52 | +.07 | 30.18 | 30.50 | 15 | 29.89 | 8 | 0.61 | 61.3 | +3.0 | 87.7 | | 369.8 | 31.0 | 24 | 54.6 | 56 | 7 | 27 | 5.5 | 19 | 6.7 | 29 | 67.9 | 49.5 | 1.35 | —1.70 | 3,300 | se. | 20 | sw. | 21 | 10 | 4 | 9 | 18 |
| Columbus | 805 | 29.30 | +.06 | 30.16 | 30.49 | 15 | 29.84 | 8 | 0.64 | 58.1 | +1.4 | 87.0 | | 367.8 | 28.8 | 24 | 50.0 | 58.2 | 30.5 | 8 | 9.8 | 27 | 71.9 | 48.1 | 1.66 | —2.17 | 4,451 | w. | 28 | sw. | 8 | 5 | 5 | 13 | 13 |
| Greencastle | ..... | 29.20 | ..... | ..... | ..... | ... | ..... | ... | ..... | 57.7 | ..... | 85.8 | | 266.4 | 28.2 | 24 | 50.4 | 57.6 | 22.8 | 24 | 9.7 | 26 | 74.8 | 48.7 | 1.27 | ..... | 3,845 | sw. | 24 | sw. | 21 | 8 | 2 | 14 | 15 |
| Indianapolis | 753 | 29.34 | +.07 | 30.14 | 30.46 | 15 | 29.84 | 8 | 0.62 | 58.3 | +2.9 | 87.0 | | 267.4 | 31.2 | 24 | 50.8 | 55.8 | 24.0 | 17 | 8.5 | 27 | 71.3 | 48.2 | 2.31 | —1.16 | 3,481 | s. | 17 | nw. | 22 | 9 | 4 | 14 | 13 |
| Knoxville | 980 | 29.15 | +.04 | 30.19 | 30.49 | 20 | 29.94 | 8 | 0.56 | 64.7 | +5.6 | 94.0 | | 377.6 | 29.0 | 24 | 54.2 | 65.0 | 34.7 | 19 | 5.4 | 28 | 69.0 | 52.0 | 2.05 | —0.96 | 2,750 | ne. | 19 | sw. | 27 | 5 | 5 | 3 | 23 |
| Louisville | 530 | 29.58 | +.08 | 30.16 | 30.44 | 15 | 29.88 | 8 | 0.50 | 63.3 | +4.8 | 90.0 | | 273.0 | 36.0 | 24 | 55.3 | 54.0 | 27.2 | 22 | 9.9 | 6 | 73.5 | 53.9 | 2.00 | —1.51 | 4,522 | n. | 22 | w. | 8 | 7 | 2 | 15 | 14 |
| Memphis | 331 | 29.82 | +.08 | 30.16 | 30.47 | 23 | 29.95 | 26 | 0.53 | 66.3 | +4.5 | 92.0 | | 175.5 | 36.0 | 24 | 58.0 | 56.0 | 29.0 | 8 | 7.0 | 27 | 72.7 | 56.2 | 2.83 | —1.17 | 3,620 | nw. | 29 | nw. | 8 | 6 | 6 | 7 | 18 |
| Nashville | 349 | 29.57 | +.06 | 30.15 | 30.44 | 24 | 29.91 | 8 | 0.53 | 65.2 | +4.3 | 91.9 | | 170.0 | 30.2 | 24 | 55.9 | 61.7 | 35.5 | 19 | 9.2 | 29 | 70.7 | 54.0 | 2.43 | —0.62 | 3,869 | nw. | 31 | se. | 26 | 4 | 6 | 9 | 16 |
| Pittsburg | 766 | 29.32 | +.02 | 30.14 | 30.49 | 25 | 29.80 | 8 | 0.69 | 58.1 | +3.2 | 91.1 | | 370.4 | 29.0 | 24 | 48.1 | 62.1 | 41.2 | 19 | 10.8 | 30 | 71.0 | 47.4 | 2.02 | —0.57 | 4,946 | nw. | 21 | nw. | 8 | 10 | 7 | 13 | 11 |
| *Lower lake region.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Buffalo | 690 | 29.37 | +.03 | 30.12 | 30.54 | 25 | 29.70 | 8 | 0.84 | 52.0 | +0.9 | 72.5 | | 459.3 | 24.7 | 26 | 44.7 | 47.8 | 28.1 | 26 | 5.5 | 4 | 82.0 | 46.4 | 1.54 | —2.38 | 8,993 | sw. | 32 | w. | 22 | 17 | 10 | 14 | 7 |
| Cleveland | 690 | 29.39 | +.03 | 30.13 | 30.49 | 25 | 29.76 | 8 | 0.73 | 55.7 | +2.5 | 84.4 | | 468.3 | 27.3 | 24 | 47.9 | 57.1 | 30.5 | 11 | 10.7 | 1 | 68.1 | 44.4 | 1.97 | —1.16 | 7,066 | s. | 32 | s. | 22 | 10 | 6 | 15 | 10 |
| Detroit | 661 | 29.40 | +.03 | 30.11 | 30.52 | 14 | 29.74 | 8 | 0.78 | 56.3 | +4.3 | 85.0 | | 365.0 | 27.8 | 24 | 47.2 | 57.2 | 28.2 | 15 | 8.4 | 28 | 65.9 | 44.5 | 1.96 | —0.91 | 7,254 | s. | 30 | s. | 27 | 9 | 9 | 11 | 11 |
| Erie | 681 | 29.39 | +.04 | 30.12 | 30.52 | 25 | 29.71 | 8 | 0.81 | 55.6 | +2.1 | 79.9 | | 463.4 | 31.4 | 26 | 48.4 | 48.5 | 35.5 | 11 | 6.1 | 14 | 73.7 | 46.9 | 3.23 | —1.11 | 8,243 | s. | 36 | nw. | 23 | 16 | 11 | 10 | 10 |
| Oswego | 334 | 29.72 | —.05 | 30.08 | 30.58 | 26 | 29.63 | 8 | 0.95 | 50.3 | —1.4 | 80.1 | | 461.9 | 25.6 | 26 | 43.0 | 54.5 | 31.8 | 21 | 7.7 | 31 | 72.0 | 40.8 | 3.21 | —0.28 | 8,612 | se. | 35 | nw. | 25 | 16 | 16 | 11 | 4 |
| Rochester | 621 | 29.43 | .00 | 30.10 | 30.58 | 26 | 29.67 | 8 | 0.91 | 51.2 | +0.9 | 84.1 | | 461.8 | 24.0 | 26 | 43.8 | 60.1 | 33.6 | 10 | 8.5 | 9 | 72.4 | 41.8 | 1.87 | —1.49 | 8,789 | sw. | 32 | sw. | 20 | 15 | 13 | 16 | 2 |
| Sandusky | 639 | 29.45 | +.05 | 30.14 | 30.52 | 14 | 29.79 | 8 | 0.73 | 56.6 | +1.0 | 86.0 | | 364.6 | 30.0 | 24 | 50.4 | 56.0 | 26.5 | 11 | 3.4 | 14 | 69.2 | 46.0 | 1.18 | —2.32 | 9,215 | sw. | 49 | n. | 8 | 7 | 7 | 12 | 12 |
| Toledo | 651 | 29.42 | +.04 | 30.12 | 30.52 | 14 | 29.76 | 8 | 0.77 | 56.3 | +2.7 | 85.0 | | 464.9 | 30.2 | 30 | 47.4 | 54.8 | 26.7 | 11 | 7.9 | 31 | 72.4 | 46.8 | 2.14 | —0.65 | 6,014 | sw. | 28 | nw. | 8 | 9 | 6 | 15 | 10 |
| *Upper lake region.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Alpena | 609 | 29.37 | —.03 | 30.04 | 30.36 | 14 | 29.69 | 5 | 0.86 | 48.3 | +2.9 | 84.0 | | 356.2 | 20.9 | 24 | 40.0 | 63.1 | 33.0 | 3 | 4.9 | 30 | 74.8 | 39.5 | 3.75 | —1.01 | 7,769 | w. | 35 | e. | 2 | 16 | 11 | 13 | 7 |
| Chicago | 661 | 29.40 | +.05 | 30.11 | 30.53 | 14 | 29.79 | 5 | 0.73 | 56.4 | +3.6 | 83.4 | | 264.2 | 27.7 | 23 | 48.6 | 55.7 | 24.3 | 24 | 6.4 | 14 | 69.3 | 45.9 | 3.59 | —0.27 | 5,745 | sw. | 35 | n. | 8 | 9 | 6 | 11 | 14 |
| Duluth | 687 | 29.27 | +.01 | 30.03 | 30.50 | 14 | 29.41 | 5 | 1.08 | 46.7 | +1.6 | 77.8 | | 954.6 | 19.4 | 23 | 40.2 | 58.4 | 31.2 | 9 | 4.9 | 30 | 72.0 | 37.3 | 3.47 | +0.39 | 6,883 | w. | 46 | ne. | 2 | 16 | 11 | 15 | 5 |
| Escanaba | 613 | 29.35 | —.01 | 30.02 | 30.54 | 14 | 29.50 | 5 | 1.04 | 47.5 | +2.4 | 77.6 | | 355.6 | 22.4 | 23 | 40.4 | 55.2 | 23.9 | 9 | 5.9 | 21 | 73.7 | 38.7 | 7.97 | +4.29 | 8,034 | s. | 36 | nw.; n | 20 | 16 | 12 | 13 | 6 |
| Grand Haven | 620 | 29.42 | +.04 | 30.09 | 30.55 | 14 | 29.76 | 5 | 0.79 | 54.1 | +3.4 | 75.6 | | 360.2 | 29.4 | 23 | 46.9 | 46.2 | 23.7 | 8 | 4.8 | 4 | 73.1 | 45.3 | 6.10 | +2.23 | 9,585 | s. | 39 | w. | 22 | 14 | 11 | 11 | 9 |
| Mackinaw City | 605 | 29.38 | —.02 | 30.05 | 30.60 | 14 | 29.64 | 5 | 0.90 | 48.8 | +0.4 | 79.0 | | 355.6 | 27.7 | 25 | 41.9 | 51.3 | 34.2 | 19 | 6.6 | 2 | 72.9 | 39.9 | 3.85 | +0.98 | 9,246 | nw. | 36 | sw. | 20 | 18 | 15 | 10 | 6 |
| Marquette | 673 | 29.29 | .00 | 30.03 | 30 57 | 14 | 29.49 | 5 | 1.08 | 47.6 | +1.7 | 81.8 | | 356.7 | 20.3 | 23 | 38.2 | 61.5 | 35.2 | 19 | 7.4 | 21 | 66.7 | 36.2 | 6.02 | +2.36 | 8,110 | nw. | 35 | sw. | 15 | 12 | 11 | 13 | 6 |
| Milwaukee | 697 | 29.33 | +.04 | 30.09 | 30.56 | 14 | 29.71 | 5 | 0.85 | 53.3 | +3.7 | 83.1 | | 361.5 | 27.2 | 23 | 46.2 | 55.5 | 27.0 | 2 | 4.2 | 26 | 72.5 | 44.0 | 2.18 | —1.67 | 8,713 | sw. | 37 | sw. | 24 | 10 | 7 | 15 | 9 |
| Port Huron | 633 | 29.39 | +.01 | 30.08 | 30.52 | 14 | 29.73 | 8 | 0.79 | 51.0 | +1.1 | 84.0 | | 360.9 | 23.8 | 24 | 43.3 | 60.2 | 32.2 | 3 | 9.0 | 13 | 77.3 | 43.4 | 4.86 | +1.79 | 6,967 | s. | 32 | nw. | 8 | 13 | 7 | 15 | 9 |
| *Upper Mississippi valley.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cairo | 377 | 29.78 | +.07 | 30.18 | 30.50 | 23 | 29.95 | 26 | 0.54 | 63.3 | +3.7 | 88.0 | | 272.3 | 38.0 | 24 | 55.5 | 50.0 | 26.7 | 8 | 5.3 | 26 | 75.4 | 54.5 | 1.89 | —1.54 | 4,395 | s. | 26 | nw. | 8 | 5 | 2 | 10 | 19 |
| Davenport | 615 | 29.45 | +.07 | 30.11 | 30.50 | 14 | 29.81 | 5 | 0.70 | 57.2 | +4.4 | 83.2 | | 365.5 | 28.6 | 23 | 49.3 | 54.6 | 23.2 | 28 | 4.2 | 1 | 71.8 | 47.3 | 7.17 | +4.37 | 6,083 | sw. | 25 | sw. | 5 | 11 | 5 | 10 | 16 |
| Des Moines | 849 | 29.19 | +.05 | 30.11 | 30.51 | 23 | 29.78 | 5 | 0.73 | 55.6 | +2.6 | 85.8 | | 365.3 | 27.6 | 23 | 46.3 | 58.2 | 30.4 | 17 | 7.1 | 30 | 71.0 | 45.5 | 5.33 | +0.73 | 4,431 | sw. | 20 | ne. | 7 | 10 | 6 | 12 | 13 |
| Dubuque | 665 | 29.38 | ..... | 30.10 | 30.51 | 14 | 29.78 | 5 | 0.73 | 55.1 | +4.2 | 85.0 | | 364.4 | 27.7 | 28 | 47.1 | 57.3 | 25.3 | 17 | 5.6 | 1 | 69.9 | 44.5 | 4.10 | +1.04 | 3,773 | s. | 20 | w. | 5 | 9 | 7 | 10 | 14 |
| Keokuk | 618 | 29.46 | +.08 | 30.13 | 30.48 | 23 | 29.84 | 20 | 0.64 | 58.5 | +3.7 | 86.2 | | 468.3 | 28.7 | 23 | 49.7 | 57.5 | 27.2 | 24 | 6.1 | 26 | 72.3 | 48.5 | 3.35 | —0.30 | 5,420 | s. | 23 | se. | 26 | 10 | 4 | 9 | 18 |
| La Crosse | 725 | 29.28 | +.02 | 30.06 | 30.51 | 14 | 29.63 | 5 | 0.88 | 54.1 | +4.5 | 84.0 | | 361.4 | 26.0 | 23 | 46.8 | 58.0 | 27.0 | 7 | 4.5 | 1 | 73.5 | 45.4 | 2.31 | —0.51 | 0,508 | s. | 31 | s. | 5 | 14 | 6 | 15 | 10 |
| Saint Louis | 583 | 29.54 | +.07 | 30.16 | 30.48 | 23 | 29.88 | 8 | 0.60 | 62 | +5.1 | 87.7 | | 572.1 | 33.9 | 23 | 55.5 | 53.3 | 32.6 | 8 | 9.5 | 27 | 71.6 | 52.9 | 2.48 | —0.22 | 7,590 | s. | 36 | nw. | 21 | 6 | 3 | 9 | 19 |
| Saint Paul | 801 | 29.16 | +.02 | 30.03 | 30.44 | 14 | 29.54 | 5 | 0.91 | 51.8 | +4.7 | 81.0 | | 201.5 | 23.0 | 23 | 43.4 | 58.0 | 29.4 | 12 | 5.8 | 1 | 71.6 | 42.3 | 2.43 | +0.22 | 6,051 | s. | 27 | ..... | ... | 11 | 9 | 13 | 9 |
| Springfield | 644 | 29.47 | +.08 | 30.16 | 30.49 | 15 | 29.88 | 7 | 0.61 | 59.7 | +2.6 | 86.0 | | 269.8 | 34.9 | 23 | 51.1 | 51.1 | 25.4 | 8 | 10.7 | 4 | 68.3 | 48.6 | 2.74 | —1.89 | 5,097 | s. | 20 | ..... | ... | 8 | 4 | 13 | 4 |
| Madison† | 961 | 29.06 | +.09 | ..... | ..... | 14 | ..... | 3 | 0.82 | 51.5 | +3.0 | 80.0 | | 360.0 | 26.0 | 23 | 44.7 | 54.0 | 26.3 | 8 | 6.2 | 4 | 78.0 | ..... | 4.00 | +1.57 | 9,190 | s. | 54 | s. | 5 | 8 | 7 | ... | ... |
| *Missouri valley.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fort Bennett | 1,510 | 28.42 | ..... | 30.04 | 30.42 | 22 | 29.55 | 2 | 0.87 | 50.6 | +4.1 | 85.0 | | 265.9 | 16.0 | 23 | 37.8 | 69.0 | 51.2 | 9 | 12.5 | 7 | 59.4 | 35.3 | 0.96 | +0.45 | 6,276 | nw. | 36 | nw. | 26 | 4 | 6 | 11 | 14 |
| Huron | 1,305 | 28.62 | +.03 | 30.05 | 30.45 | 23 | 29.61 | 10 | 0.84 | 49.6 | +3.7 | 81.8 | | 262.8 | 22.0 | 23 | 38.3 | 59.8 | 41.5 | 9 | 10.6 | 7 | 65.7 | 37.2 | 1.52 | —0.21 | 8,101 | n. | 31 | w. | 5 | 7 | 6 | 10 | 15 |
| Leavenworth | 842 | 29.21

*Table of miscellaneous meteorological data for October, 1884—Signal Service observations*—Continued.

| Stations. | Elevation above sea-level. | Atmospheric pressure. | | | | | | | Temperature of the air (in degrees Fahrenheit). | | | | | | | | | | | | | | Mean rel. humidity. | Mean dew-point. | Precipitation. | Departure from normal | Winds. | | | | Rainy days. | Cloudy days. | Fair days. | Clear days. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean actual barometer. | Departure from normal. | Mean reduced barometer. | Extremes. | | | | Monthly mean. | Departure from normal. | Extremes. | | | | | | Daily ranges. | | | | | | | | | | Total movement. | Prevailing direction. | Max. velocity. | | | | | |
| | | | | | Highest barometer | Date. | Lowest barometer | Date. | Monthly range of barometer. | | Max. | Date. | Mean max | Min. | Date. | Mean min | Monthly range. | Greatest. | Date. | Least. | Date. | | | | | | | | Miles p.hr | Direction. | Date. | | | | |
| *Extreme northwest.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Moorhead | 923 | 28.98 | —.01 | 30.00 | 30.43 | 23 | 29.31 | 5 | 1.12 | 44.4 | +1.8 | 77.7 | 2 | 56.0 | 14.9 | 23 | 35.0 | 62.8 | 36.0 | 9 | 8.5 | 29 | 65.8 | 32.4 | 3.70 | +1.61 | 9,843 | s. | 45 | s. | 25 | 9 | 8 | 15 | 8 |
| Bismarck | 1,694 | 28.16 | .00 | 30.04 | 30.50 | 20 | 29.61 | 10 | 0.84 | 46.5 | +4.1 | 80.6 | 18 | 58.9 | 10.5 | 27 | 35.7 | 70.1 | 42.3 | 23 | 11.5 | 31 | 67.1 | 34.9 | 0.92 | —0.41 | 7,037 | nw. | 35 | nw. | 21 | 5 | 4 | 13 | 14 |
| Fort Buford | 1,930 | 27.92 | —.03 | 30.02 | 30.42 | 22 | 29.62 | 18 | 0.79 | 44.5 | +2.9 | 85.9 | 18 | 32.6 | 14.3 | 27 | 22.8 | 71.6 | 43.8 | 9 | 8.3 | 2 | 62.7 | 30.5 | 0.44 | —0.61 | 7,320 | w. | 48 | nw. | 25 | 6 | 10 | 16 | 5 |
| Saint Vincent | 804 | 29.07 | —.02 | 29.97 | 30.43 | 20 | 29.36 | 5 | 1.06 | 42.0 | +2.1 | 75.4 | 15 | 52.8 | 10.2 | 31 | 31.7 | 65.2 | 35.3 | 13 | 6.0 | 29 | 75.2 | 34.0 | 1.15 | —0.43 | 8,467 | nw. | 38 | s. | 8 | 10 | 9 | 13 | 9 |
| Fort Totten | ..... | 28.34 | ..... | ..... | ..... | ... | ..... | ... | ..... | 42.6 | ..... | 85.8 | 18 | 55.9 | 12.0 | 31 | 32.2 | 73.8 | 43.3 | 18 | 6.0 | 29 | 71.9 | 32.9 | 0.92 | ..... | 11,696 | nw. | 44 | nw. | 6 | 9 | 6 | 14 | 11 |
| *Pacific coast region.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cape Mendocino | 637 | 29.35 | +.04 | 30.04 | 30.23 | 31 | 29.62 | 12 | 0.62 | 54.2 | ..... | 75.8 | 23 | 60.9 | 42.2 | 1 | 49.1 | 33.6 | 25.4 | 22 | 6.1 | 18 | 80.8 | 47.9 | 0.52 | ..... | 12,964 | n. | 68 | s. | 12 | 4 | 2 | 12 | 17 |
| Fort Canby | 179 | 29.82 | +.01 | 30.02 | 30.42 | 25 | 29.42 | 12 | 1.00 | 52.2 | ..... | 67.0 | 16 | 57.1 | 42.0 | 14 | 46.8 | 25.0 | 16.4 | 12 | 4.2 | 19 | 88.4 | 48.8 | 6.24 | ..... | 8,868 | s. | 56 | s. | 8 | 9 | 9 | 7 | 15 |
| Los Angeles | 371 | 29.60 | —.01 | 30.00 | 30.19 | 27 | 29.71 | 1 | 0.48 | 62.3 | 0 | 89.1 | 22 | 74.3 | 42.9 | 7 | 51.2 | 46.2 | 36.6 | 7 | 3.0 | 12 | 71.8 | 51.1 | 0.39 | —0.28 | 3,707 | w. | 24 | nw. | 2 | 2 | 2 | 4 | 25 |
| Olympia | 36 | 30.01 | +.02 | 30.05 | 30.45 | 26 | 29.47 | 2 | 0.98 | 50.1 | +1.7 | 66.5 | 17 | 58.8 | 34.5 | 3 | 43.7 | 32.0 | 27.5 | 17 | 5.0 | 18 | 83.3 | 45.0 | 4.30 | —1.30 | 1,723 | s. | 19 | s. | 8 | 15 | 12 | 12 | 7 |
| Portland | 67 | 29.98 | .00 | 30.05 | 30.42 | 26 | 29.45 | 12 | 0.97 | 51.2 | —1.6 | 72.0 | 16 | 61.9 | 36.0 | 20 | 44.9 | 36.0 | 25.0 | 16 | 9.0 | 11 | 82.5 | 45.6 | 4.01 | —0.94 | 3,211 | s. | 22 | s. | 11 | 17 | 12 | 11 | 8 |
| Red Bluff | 332 | 29.65 | .00 | 30.01 | 30.24 | 21 | 29.72 | 9 | 0.53 | 02.1 | +0.6 | 87.0 | 22 | 75.3 | 41.5 | 28 | 49.8 | 45.5 | 34.5 | 22 | 12.0 | 31 | 52.8 | 42.3 | 0.90 | —0.61 | 3,920 | n. | 28 | n. | 13 | 3 | 0 | 5 | 22 |
| Roseburg | ..... | 29.61 | ..... | ..... | ..... | ... | ..... | ... | ..... | 51.0 | +1.2 | 75.7 | 8 | 64.5 | 33.9 | 3 | 43.6 | 44.8 | 32.9 | 3 | 11.7 | 18 | 82.6 | 45.8 | 1.15 | —2.07 | 1,302 | nw. | ... | ..... | ... | 9 | 5 | 17 | 9 |
| Sacramento | 64 | 29.92 | —.02 | 29.99 | 30.19 | 27 | 29.74 | 9 | 0.45 | 59.9 | —0.4 | 80.5 | 8 | 72.1 | 42.0 | 3 | 49.6 | 38.5 | 31.0 | 11 | 3.5 | 13 | 71.2 | 49.8 | 2.01 | +1.11 | 3,495 | n. | 20 | sw. | 12 | 4 | 1 | 4 | 26 |
| San Diego | 67 | 29.89 | —.01 | 29.96 | 30.13 | 17 | 29.70 | 1 | 0.43 | 01.3 | —1.3 | 87.0 | 22 | 68.8 | 47.0 | 0 | 54.3 | 40.0 | 35.0 | 22 | 4.2 | 12 | 77.3 | 53.5 | 0.35 | —0.14 | 4,034 | w. | 22 | e. | 22 | 3 | 4 | 9 | 18 |
| San Francisco | 60 | 29.94 | —.03 | 30.01 | 30.21 | 21 | 29.80 | 1 | 0.41 | 56.9 | —2.2 | 75.5 | 8 | 64.0 | 50.0 | ... | 52.5 | 25.5 | 21.0 | 8 | 5.0 | 19 | 84.5 | 52.0 | 2.55 | —1.42 | 4,922 | w. | 26 | w. | 9 | 4 | 4 | 14 | 13 |
| *Northern slope.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fort Assinaboine | 2,720 | 27.11 | .00 | 30.04 | 30.54 | 21 | 29.69 | 1 | 0.85 | 46.4 | +7.4 | 83.0 | 13 | 59.3 | 13.8 | 27 | 33.7 | 69.2 | 41.2 | 27 | 8.7 | 1 | 48.6 | 25.2 | 0.41 | —0.29 | 9,647 | w. | 60 | sw. | 13 | 6 | 7 | 12 | 12 |
| Cheyenne | 6,105 | 24.07 | +.07 | 30.11 | 30.48 | 16 | 29.69 | 1 | 0.79 | 47.0 | +3.3 | 70.8 | 2 | 63.2 | 9.4 | 27 | 33.8 | 67.4 | 40.7 | 8 | 12.9 | 20 | 50.9 | 27.3 | 0.50 | —0.30 | 7,473 | nw. | 42 | w. | 5 | 4 | 5 | 11 | 15 |
| Deadwood | 4,600 | 25.40 | +.06 | 30.08 | 30.44 | 16 | 29.64 | 1 | 0.80 | 49.5 | +7.8 | 76.0 | 14 | 60.1 | 26.0 | 27 | 39.5 | 50.0 | 32.5 | 8 | 8.0 | 7 | 54.0 | 31.8 | 1.48 | —0.08 | 3,024 | se. | 23 | ne. | 6 | 7 | 2 | 12 | 16 |
| Fort Benton | 2,681 | 27.19 | ..... | 30.09 | 30.49 | 16 | 29.70 | 1 | 0.80 | 46.4 | +2.5 | 81.4 | 17 | 60.9 | 19.5 | 7 | 33.6 | 61.9 | 49.9 | 17 | 11.8 | 1 | 53.1 | 28.2 | 0.36 | —0.89 | 0,894 | sw. | 40 | sw. | 31 | 4 | 9 | 11 | 8 |
| Fort Custer | 3,040 | 26.83 | +.01 | 30.07 | 30.46 | 16 | 29.47 | 1 | 0.99 | 48.4 | +3.2 | 84.1 | 18 | 64.6 | 20.3 | 27 | 34.7 | 63.8 | 40.1 | 9 | 9.4 | 20 | 64.8 | 35.2 | 0.66 | —4.00 | 4,697 | se. | 36 | nw. | 31 | 6 | 6 | 14 | 11 |
| Fort Maginnis | 4,340 | 25.54 | ..... | 30.08 | 30.48 | 16 | 29.74 | 1 | 0.74 | 43.0 | ..... | 76.2 | 13 | 55.9 | 20.3 | 27 | 32.2 | 55.9 | 42.0 | 13 | 10.8 | 26 | 53.1 | 20.4 | 0.33 | ..... | 9,229 | ne. | 46 | nw. | 28 | 6 | 6 | 13 | 12 |
| Fort Shaw | 3,550 | 26.33 | ..... | 30.03 | 30.41 | 16 | 29.67 | 1 | 0.74 | 46.3 | +7.1 | 78.0 | 17 | 59.1 | 21.5 | 20 | 34.9 | 56.5 | 45.5 | 17 | 6.5 | 2 | 51.3 | 27.0 | 0.39 | —0.81 | 8,759 | w. | 46 | w. | 25 | 3 | 2 | 16 | 13 |
| Helena | 4,044 | 25.84 | .00 | 30.08 | 30.50 | 16 | 29.53 | 1 | 0.97 | 47.0 | +5.9 | 74.0 | 9 | 57.6 | 28.0 | 7 | 38.6 | 46.0 | 29.0 | 9 | 4.0 | 2 | 51.3 | 28.9 | 0.49 | —0.97 | 4,031 | w. | 29 | w. | 25 | 4 | 3 | 15 | 13 |
| Poplar River | 2,030 | 27.81 | ..... | 30.03 | 30.44 | 22 | 29.65 | 18 | 0.79 | 42.7 | ..... | 83.0 | 18 | 59.2 | 11.1 | 23 | 28.9 | 71.9 | 50.1 | 23 | 4.7 | 1 | 77.4 | 35.2 | 0.46 | ..... | 6,071 | w. | 35 | w. | 25 | 6 | 8 | 10 | 13 |
| Spokane Falls | 1,906 | 27.99 | +.05 | 30.07 | 30.52 | 16 | 29.67 | 12 | 0.84 | 46.9 | +3.0 | 70.5 | 8 | 57.2 | 26.0 | 7 | 37.9 | 44.5 | 33.8 | 8 | 9.0 | 11 | 72.6 | 37.7 | 1.82 | —1.19 | 2,675 | sw. | 17 | sw. | 8 | 13 | 12 | 9 | 10 |
| *Middle slope.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Denver | 5,294 | 24.79 | +.06 | 30.05 | 30.43 | 16 | 29.60 | 1 | 0.83 | 55.5 | +5.9 | 80.3 | 6 | 68.7 | 26.0 | 27 | 41.9 | 54.3 | 38.2 | 9 | 16.5 | 20 | 48.9 | 34.1 | 0.21 | —0.58 | 4,140 | s. | 32 | sw. | ... | 4 | 4 | 15 | 12 |
| Dodge City | 2,517 | 27.49 | +.09 | 30.12 | 30.41 | 23 | 29.85 | 1 | 0.56 | 57.6 | +2.6 | 83.2 | 17 | 69.9 | 29.5 | 30 | 47.7 | 53.7 | 33.1 | 30 | 9.9 | 3 | 71.2 | 46.8 | 1.50 | +0.17 | 10,248 | se. | 48 | se. | 1 | 8 | 6 | 7 | 18 |
| Fort Elliott | 2,650 | 27.34 | +.08 | 30.13 | 30.38 | 23 | 29.87 | 26 | 0.51 | 59.4 | +2.5 | 87.0 | 5 | 71.2 | 33.5 | 30 | 49.9 | 53.5 | 38.0 | 9 | 8.0 | 25 | 74.1 | 49.9 | 5.45 | +2.77 | 7,238 | s. | 31 | s. | 19 | 10 | 6 | 9 | 16 |
| North Platte | 2,841 | 27.12 | +.01 | 30.08 | 30.40 | 23 | 29.68 | 2 | 0.72 | 54.6 | +5.2 | 83.0 | ... | 67.9 | 20.0 | 23 | 42.8 | 57.0 | 38.6 | 31 | 12.9 | 29 | 64.3 | 41.3 | 0.74 | —0.65 | 7,307 | s. | 45 | sw. | 5 | 7 | 5 | 12 | 14 |
| Pike's Peak | 14,134 | 17.92 | ..... | 30.20 | 30.56 | 16 | 29.90 | 26 | 0.66 | 24.4 | +3.4 | 39.5 | 9 | 30.3 | — 5.0 | 27 | 18.8 | 44.5 | 21.3 | 8 | 6.3 | 20 | 79.7 | 18.8 | 0.99 | —0.54 | 10,614 | sw. | 68 | w. | 5 | 9 | 1 | 13 | 17 |
| West Las Animas | 3,899 | 26.07 | +.09 | 30.00 | 30.32 | 16 | 29.61 | 1 | 0.71 | 56.0 | +3.7 | 90.5 | 6 | 74.4 | 23.3 | 31 | 41.2 | 67.3 | 53.5 | 31 | 15.7 | 25 | 65.0 | 42.3 | 0.43 | +0.05 | 5,256 | s. | 32 | s. | 2 | 6 | 6 | 12 | 13 |
| *Southern slope.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fort Concho | 1,900 | 28.17 | +.07 | 30.12 | 30.37 | 23 | 29.88 | 26 | 0.49 | 65.1 | 0 | 91.8 | 5 | 78.0 | 40.8 | 25 | 55.5 | 51.0 | 35.2 | 18 | 6.5 | 24 | 73.0 | 55.0 | 5.49 | +2.85 | 5,679 | s. | 28 | s. | 1 | 6 | 7 | 12 | 12 |
| Fort Davis | 4,928 | 25.26 | ..... | 30.10 | 30.29 | 16 | 29.91 | 1 | 0.38 | 59.6 | —2.0 | 82.0 | 7 | 71.8 | 36.0 | 30 | 49.5 | 46.0 | 37.9 | 31 | 5.0 | 23 | 74.8 | 50.1 | 4.35 | —2.34 | 4,512 | ne. | 20 | ne. | 8 | 6 | 10 | 13 | 8 |
| Fort Sill | 1,200 | ..... | ..... | ..... | ..... | ... | ..... | ... | ..... | ..... | ..... | ..... | ... | ..... | ..... | ... | ..... | ..... | ..... | ... | ..... | ... | ..... | ..... | ..... | ..... | ..... | ... | ..... | ... | ..... | ... | ... | ... | ... |
| Fort Stockton | 3,010 | 27.06 | +.07 | 30.10 | 30.32 | 16 | 29.85 | 1 | 0.47 | 63.9 | +0.4 | 87.8 | 5 | 75.7 | 40.3 | 28 | 54.7 | 47.5 | 28.8 | 18 | 3.9 | 24 | 74.8 | 54.3 | 6.25 | +5.29 | 6,859 | se. | 36 | se. | 1 | 12 | 5 | 13 | 13 |
| *Northern plateau.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boisé City | 2,750 | 27.23 | ..... | 30.09 | 30.41 | 16 | 29.42 | 1 | 0.99 | 51.3 | +3.7 | 77.4 | 12 | 62.2 | 29.8 | 7 | 41.5 | 47.6 | 34.4 | 12 | 11.8 | 1 | 60.2 | 36.4 | 1.52 | +0.27 | 3,556 | nw. | 25 | nw. | 1 | 6 | 4 | 14 | 13 |
| Dayton | 1,667 | 28.31 | ..... | 30.10 | 30.44 | 16 | 29.62 | 12 | 0.82 | 50.8 | +3.4 | 73.7 | 12 | 62.3 | 28.8 | 7 | 40.4 | 44.9 | 32.8 | 23 | 11.7 | 1 | 68.2 | 39.7 | 3.45 | +0.81 | 4,244 | sw. | 22 | sw. | 13 | 12 | 8 | 11 | 12 |
| Lewiston | 780 | 29.21 | ..... | 30.09 | 30.58 | 15 | 29.57 | 12 | 1.01 | 50.4 | +1.8 | 73.6 | 13 | 61.1 | 31.0 | 7 | 41.7 | 42.6 | 29.0 | 24 | 6.5 | 1 | 73.7 | 41.5 | 2.08 | +0.15 | 1,149 | ne. | 25 | nw. | 9 | 16 | 6 | 12 | 13 |
| *Middle plateau.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Salt Lake City | 4,348 | 25.68 | +.04 | 30.08 | 30.37 | 16 | 29.33 | 1 | 1.04 | 52.6 | +2.0 | 79.5 | 17 | 62.6 | 31.7 | 27 | 43.4 | 47.8 | 31.5 | 5 | 7.7 | 7 | 52.4 | 34.4 | 0.36 | —1.59 | 3,947 | nw. | 32 | sw. | 1 | 5 | 4 | 11 | 16 |
| Carson City‡ | 4,630 | 25.38 | ..... | ..... | ..... | ... | ..... | ... | 0.69 | 48.6 | ..... | 77.0 | 16 | ..... | 22.5 | 27 | ..... | 54.5 | ..... | ... | ..... | ... | 62.0 | ..... | 0.22 | ..... | 1,722 | sw. | 12 | ..... | ... | 4 | 9 | ... | ... |
| *Southern plateau.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Camp Thomas | 2,710 | 27.24 | ..... | 29.94 | 30.22 | 16 | 29.59 | 1 | 0.63 | 65.2 | +7.1 | 89.5 | 5 | 78.1 | 33.1 | 28 | 52.4 | 56.4 | 41.7 | 5 | 9.2 | 22 | 59.7 | 49.0 | 0.69 | +0.44 | ..... | s. | ... | ..... | ... | 4 | 2 | 15 | 14 |
| El Paso | 3,764 | 26.31 | +.06 | 30.05 | 30.33 | 16 | 29.77 | 1 | 0.56 | 62.6 | —1.2 | 84.6 | 5 | 76.2 | 37.1 | 29 | 54.3 | 47.5 | 33.9 | 29 | 7.0 | 24 | 71.1 | 51.9 | 5.15 | +4.16 | 1,539 | e. | 19 | w. | 10 | 12 | 8 | 12 | 11 |
| Fort Apache | 5,050 | 25.04 | +.02 | 29.94 | 30.16 | 16 | 29.60 | 1 | 0.57 | 56.9 | +4.8 | 85.3 | 5 | 44.4 | 27.0 | 28 | 42.2 | 53.8 | 48.2 | 5 | 8.9 | 24 | 04.7 | 43.0 | 2.02 | +0.17 | 4,813 | ne. | 26 | s. | 18 | 8 | 5 | 9 | 17 |
| Fort Grant | 4,856 | 25.24 | ..... | 29.94 | 30.16 | 16 | 29.66 | 1 | 0.50 | 63.3 | +1.9 | 85.5 | 5 | 73.4 | 43.0 | 28 | 55.1 | 42.5 | 26.9 | 30 | 8.2 | 10 | 54.4 | 44.8 | 3.06 | +2.30 | 6,840 | se. | 36 | se. | 15 | 8 | 3 | 15 | 13 |
| Prescott | 5,389 | 24.75 | +.03 | 29.95 | 30.21 | 16 | 29.52 | 1 | 0.69 | 53.5 | +0.8 | 79.0 | 8 | 68.7 | 29.6 | 28 | 41.5 | 49.4 | 42.6 | 8 | 13.9 | 23 | 57.0 | 35.9 | 1.42 | ..... | 4,174 | s. | 37 | s. | 1 | 4 | 1 | 11 | 19 |
| Yuma | ..... | ..... | ..... | ..... | ..... | ... | ..... | ... | ..... | 68.0 | —3.6 | ..... | ... | ..... | ..... | ... | ..... | ..... | ..... | ... | ..... | ... | ..... | ..... | ..... | ..... | ..... | ... | ..... | ... | ..... | ... | ... | ... | ... |
| *Rio Grande valley.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Brownsville | 59 | 29.97 | +.03 | 30.03 | 30.21 | 16 | 29.89 | 2 | 0.32 | 73.5 | —2.0 | 88.0 | 8 | 82.8 | 57.0 | 28 | 68.3 | 31.0 | 20.4 | 10 | 7.0 | 24 | 87.8 | 69.3 | 15.71 | +12.4 | 3,934 | n. | 25 | ne. | 24 | 17 | 10 | 14 | 7 |
| Rio Grande City | 230 | 29.86 | +.04 | 30.10 | 30.30 | 16 | 29.88 | 2 | 0.42 | 74.2 | —0.1 | 93.7 | 7 | 84.1 | *57.0 | 28 | 67.0 | 36.0 | 26.5 | 10 | 6.0 | 25 | 78.0 | 65.9 | 4.45 | +2.34 | 3,692 | e. | 28 | e.;n. | 28 | 12 | 7 | 11 | 13 |
| *Florida peninsula.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cedar Keys | 22 | 30.05 | +.02 | 30.07 | 30.32 | 24 | 29.87 | 9 | 0.44 | 74.3 | +0.2 | 89.1 | 8 | 82.1 | 52.7 | 24 | 67.2 | 36.3 | 22.3 | 16 | 8.1 | 15 | 73.7 | 64.8 | 0.13 | —4.00 | 7,285 | ne. | 26 | ne. | 15 | 2 | 0 | 7 | 24 |
| Key West | 20 | 29.96 | —.01 | 29.98 | 30.16 | 25 | 29.78 | 14 | 0.38 | 78.3 | —0.8 | 86.6 | 1 | 81.9 | 70.3 | 19 | 74.7 | 16.3 | 11.8 | 5 | 3.5 | 13 | 77.3 | 70.3 | 3.17 | —1.93 | 10,614 | ne. | 28 | ne;n. | 15 | 15 | 3 | 19 | 9 |
| Sanford | 36 | 29.98 | ..... | 30.02 | 30.26 | 20 | 29.84 | 9 | 0.42 | 74.4 | ..... | 94.0 | 9 | 84.5 | 55.5 | 18 | 66.1 | 38.5 | 28.8 | 18 | 4.6 | 16 | 78.0 | 66.6 | 2.19 | ..... | 6,198 | ne. | 64 | n. | 15 | 11 | 1 | 16 | 14 |

* Total movement of wind insufficient on account of frost-work.
† Observations taken at the Washburne Observatory, University of Wisconsin, made by voluntary observer.
‡ Observations taken at the Boswell Observatory by Professor G. D. Swezey, voluntary observer.
§ Observations taken by Chas. W. Friend, voluntary observer.

## ATMOSPHERIC ELECTRICITY.

### AURORAS.

No extensive auroral display was observed during the month. The display observed by the largest number of stations, occurred on the evening of the 1st; it was seen at scattering stations in New England; at Cape Henry, Virginia; Portsmouth, Ohio; Richmond, Kentucky; Vevay, Indiana, and Port Angeles, Washington Territory. The following descriptions relate to this display:

Bangor, Maine, 1st: at 8 p. m., an aurora was observed extending but a short distance above the northern horizon; at 11 p. m., the light had extended to the zenith; the display continued until daylight on the 2d, being very bright at 4 a. m.

Mount Washington, New Hampshire, 1st: an auroral light was visible from 9.30 p. m. until after midnight; the display consisted of pale streamers, without apparent motion, reaching nearly to the zenith, and covering 70° of the northern horizon.

Bethel, Connecticut, 1st: a faint auroral light was observed in the north during the evening.

Eastport, Maine, 1st: an aurora was visible from 10.40 p. m. until 4 a. m. of the 2d; waves of rose-tinted light shot upward nearly to the zenith.

Albany, New York, 1st: at 11.30 p. m., an aurora consisting of waves and flashes of hazy light, extended from azimuth 135° to 270°, and upward to the zenith. At 1 a. m. of the 2d, the display was obscured by clouds.

Cape Henry, Virginia, 1st: a very faint aurora was observed between 10 and 11 p. m.; it consisted of a whitish light 3° in width, and about 10° above the northern horizon. No beams or "merry dancers" were observed; the display disappeared about 11 p. m.

Syracuse, New York, 1st: bright auroral streamers were visible at 10 p. m.

Portsmouth, Ohio, 1st: an auroral light was observed in the northwestern sky at 11 p. m.

Richmond, Kentucky, 1st: from 9 to 11 p. m., an auroral arch was visible extending from northeast to northwest and to an altitude of 10°; occasional faint streamers were also observed.

Vevay, Indiana, 1st: at 11 p. m., an auroral light extended from north-northwest to northeast; beams of hazy light reached the zenith; the display continued until after midnight.

Burlington, Iowa, 1st: an aurora was observed at 10.45 p. m.; it appeared in the northwestern sky and extended from the horizon to an altitude of 50°. The rays of white light blended into purple, presenting a beautiful appearance for about five minutes.

Port Angeles, Washington Territory, 1st: a faint aurora was observed in the north at 7 p. m.; it remained visible for about one and one-half hours, resembling in appearance the morning dawn.

At Pysht, Washington Territory, an auroral light was visible at 4 a. m. on the 1st.

Displays observed on other dates during the month are as follows:

2d.—Sidney, Nova Scotia; Eastport and Orono, Maine; Oswego, New York; Moorhead, Minnesota.

4th.—Allison, Kansas.

6th.—Eastport, Maine; Alpena and Ionia, Michigan; Winnipeg, Manitoba.

7th.—Hartford, Connecticut.

9th.—Alpena and Escanaba, Michigan; Webster, Dakota, Winnipeg, Manitoba.

12th.—Winnipeg, Manitoba.

13th.—Escanaba, Michigan.

14th.—Eastport, Maine.

15th.—Charlottetown, Prince Edward Island; Gardiner, Maine; Winnipeg, Manitoba.

18th.—Eastport, Maine.

19th and 20th.—Winnipeg, Manitoba.

24th.—Eastport, Maine; Huron, Dakota.

26th.—Eastport, Maine; Clay Centre, Kansas.

27th.—Clay Centre, Kansas.

28th.—Gardiner, Maine.

### THUNDER-STORMS.

Thunder-storms were reported in the various states and territories as follows:

*Alabama.*—9th, 10th, 19th, 20th.

*Arizona.*—5th, 6th, 10th, 13th, 14th, 18th, 22d, 23d, 24th, 26th.

*California.*—1st, 9th, 12th, 16th, 18th, 19th.

*Colorado.*—West Las Animas, 19th.

*Connecticut.*—Bethel, 14th; Colebrook and New Haven, 12th.

*Dakota.*—1st, 2d, 4th, 6th.

*Delaware.*—Delaware Breakwater, 12th.

*Florida.*—2d, 4th, 6th, 9th to 14th, 19th to 23d.

*Georgia.*—9th, 10th, 22d, 30th.

*Idaho.*—13th, 14th, 17th, 18th.

*Illinois.*—1st, 3d, 4th, 5th, 7th, 8th, 16th.

*Indiana.*—1st, 2d, 4th, 5th, 7th, 16th, 21st.

*Iowa.*—1st, 3d, 4th, 6th, 7th, 11th, 16th, 20th.

*Kansas.*—1st, 3d, 5th, 6th, 7th, 20th.

*Kentucky.*—1st, 2d, 4th, 7th to 12th, 15th.

*Louisiana.*—2d, 3d, 4th, 19th to 22d, 26th.

*Maine.*—12th, 13th.

*Massachusetts.*—3d, 4th, 6th, 12th, 13th, 18th.

*Michigan.*—1st to 5th, 8th, 12th, 15th, 16th, 19th, 21st.

*Minnesota.*—2d, 6th, 20th.

*Nebraska.*—1st, 3d, 4th, 6th.

*Nevada.*—Carson City, 12th, 16th.

*New Jersey.*—6th, 12th, 28th.

*New York.*—1st, 4th, 6th, 12th, 13th, 16th to 19th, 22d.

*North Carolina.*—1st, 9th, 10th, 12th, 30th.

*Ohio.*—1st, 4th, 5th, 7th, 8th, 16th, 21st, 31st.

*Oregon.*—12th, 16th, 17th.

*Pennsylvania.*—1st, 4th, 7th, 8th, 11th, 12th, 17th, 18th.

*Rhode Island.*—Providence, 12th; Point Judith, 12th, 18th.

*South Carolina.*—Stateburg, 8th, 9th.

*Tennessee.*—1st, 7th, 8th, 10th, 21st.

*Texas.*—2d, 3d, 4th, 6th, 7th, 9th, 10th, 12th, 14th, 15th, 18th to 23d, 25th.

*Utah.*—Salt Lake City, 14th.

*Vermont.*—4th, 6th, 12th, 13th, 19th.

*Virginia.*—2d, 8th, 9th, 12th, 22d.

*Washington Territory.*—11th, 12th, 13th, 17th, 18th, 24th.

*Wisconsin.*—3d to 6th, 16th, 18th, 31st.

#### REPORT OF THUNDER STORMS OBSERVED BY SPECIAL VOLUNTARY OBSERVERS, PREPARED BY PROF. H. A. HAZEN.

The total number reported was 461. Twenty or more occurred on the following days: 1st, 21; 4th, 60; 5th, 33; 6th, 24; 7th, 22; 8th, 35; 12th, 40; 16th, 24, and 22d, 24. On the 4th a trough-like depression of no great depth extended from southwest to northeast, central in Illinois. The storms were mostly grouped along the southeast border of the depression. On the 5th the storms were central in Illinois and Indiana in a south-southeast direction from the "low" and at an average distance of 600 miles. On the 8th storms were most frequent in Pennsylvania and Maryland, at a distance of 330 miles from "low," and toward the south-southwest. Comparing the number of storms by districts with the records of voluntary observers from 1851 to 1873 we have Table i. The districts are: i., New England and New York; ii., Delaware, Maryland, New Jersey, North Carolina, Pennsylvania, Virginia, and West Virginia; iii., Illinois, Indiana, Kentucky, Ohio, and Tennessee; iv., Michigan, Minnesota, and Wisconsin; v., Dakota, Iowa, Kansas, Missouri, Montana, and Nebraska. We see from this table a marked excess in the number of storms in all the districts, amounting over the whole country to nearly .5 storm per station.

TABLE I.—*Mean number of thunder-storms in October at each station, by districts.*

| District. | 1851–1873. | | 1884. | | Difference. | |
|---|---|---|---|---|---|---|
| | Stations. | No. | Stations. | No. | Stations. | No. |
| I | 12 | 1.41 | 33 | 1.85 | + 21 | + .44 |
| II | 10 | 1.38 | 50 | 1.72 | + 40 | + .34 |
| III | 14 | 1.58 | 36 | 2.56 | + 22 | + .98 |
| IV | 6 | 1.64 | 14 | 1.79 | + 8 | + .15 |
| V | 9 | 1.54 | 33 | 1.85 | + 24 | + .31 |
| Total | 51 | 1.49 | 166 | 1.95 | +115 | + .46 |

TABLE II.—*Mean number of thunder-storms per station in all districts for October; also mean declination range.*

| Year. | Stations. | No. | Departure. | Magnetic Declination. | Departure. | Year. | Stations. | No. | Departure. | Magnetic Declination. | Departure. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1851 | 33 | 1.21 | +.27 | ..... | ..... | 1864 | 33 | 1.21 | +.27 | 1.44 | — .12 |
| 1852 | 48 | 1.54 | —.06 | ..... | ..... | 1865 | 60 | 1.73 | —.25 | 1.45 | — .13 |
| 1853 | 32 | 1.12 | +.36 | 1.07 | +.25 | 1866 | 65 | 1.21 | +.27 | 1.36 | — .04 |
| 1854 | 48 | 1.71 | —.23 | 1.29 | +.03 | 1867 | 83 | 1.37 | +.11 | 1.51 | — .19 |
| 1855 | 47 | 1.64 | —.16 | 1.14 | +.18 | 1868 | 49 | 1.65 | —.17 | 1.13 | + .19 |
| 1856 | 47 | 2.09 | —.61 | 1.07 | +.25 | 1869 | 49 | 1.08 | +.40 | 1.58 | — .26 |
| 1857 | 18 | 1.28 | +.20 | 0.99 | +.33 | 1870 | 63 | 1.44 | +.04 | 1.14 | + .18 |
| 1858 | 62 | 1.92 | —.44 | 1.69 | +.23 | 1871 | 60 | 1.30 | +.18 | 1.59 | — .27 |
| 1859 | 65 | 1.52 | —.04 | 1.62 | —.30 | 1872 | 77 | 1.44 | +.04 | 1.19 | + .13 |
| 1860 | 60 | 1.53 | —.05 | 1.73 | —.41 | 1873 | 61 | 1.34 | +.14 | 1.16 | + .16 |
| 1861 | 77 | 1.58 | —.10 | 1.48 | —.16 | | | | | | |
| 1862 | 28 | 1.93 | —.45 | 1.25 | +.07 | Mean | ..... | 1.48 | ..... | 1.32 | ..... |
| 1863 | 34 | 1.20 | +.28 | 1.36 | —.04 | | | | | | |

Table ii. gives values of mean number of storms for each October from 1851 to 1873, and also the mean diurnal range of magnetic declination at Trevandrum. If these figures be projected graphically there will be found a partial coincidence between the maximum and minimum points in each curve. The fluctuations however are small.

## OPTICAL PHENOMENA.

### SOLAR HALOS.

Solar halos were observed during October, in the several districts as follows:

*New England.*—Hartford, Connecticut, 29th; Cornish, Maine, 8th, 29th; Orono, Maine, 29th; Somerset, Massachusetts, 2d.

*Middle Atlantic states.*—Baltimore, Maryland, 26th; Cape

May, New Jersey, 26th; Dyberry, Pennsylvania, 26th; Wellsborough, Pennsylvania, 21st, 23d; Variety Mills, Virginia, 26th; Dale Enterprise, Virginia, 24th.

*South Atlantic states.*—Hatteras, North Carolina, 10th, 28th; Stateburg, South Carolina, 16th, 23d, 25th.

*Florida peninsula.*—Key West, 2d; Archer, 9th.

*West Gulf states.*—Fort Smith, Arkansas, 24th, 30th; Little Rock, Arkansas, 24th; Lead Hill, Arkansas, 1st, 22d, 25th, 28th; Point Pleasant, Louisiana, 24th.

*Tennessee.*—Nashville, 20th, 25th, 28th, 31st.

*Ohio valley.*—Pittsburg, Pennsylvania, 17th; Frankfort, Kentucky, 14th.

*Lower lake region.*—Erie, Pennsylvania, 15th; Buffalo, New York, 7th, 11th, 15th, 16th, 26th, 29th; Cleveland, Ohio, 26th; Oswego, New York, 26th; North Volney, New York, 26th; Palermo, New York, 29th; Wauseon, Ohio, 14th, 15th, 17th, 26th.

*Upper lake region.*—Escanaba, Michigan, 10th, 17th, 28th; Grand Haven, 9th, 10th, 26th; Milwaukee, Wisconsin, 11th; Riley, Illinois, 11th, 14th, 17th, 27th, 29th; Thornville, Michigan, 7th.

*Upper Mississippi valley.*—La Crosse, Wisconsin, 14th; Keokuk, Iowa, 13th, 25th; Davenport, Iowa, 6th, 11th, 27th, 29th.

*Middle slope.*—Fort Elliott, Texas, 23d; Independence, Kansas, 24th; Yates Centre, Kansas, 20th, 24th, 25th, 29th; Maud, Kansas, 24th.

*Middle plateau.*—Salt Lake City, Utah, 27th; Nephi, Utah, 15th, 27th.

*Northern plateau.*—Dayton, Washington Territory, 19th; Boisé City, Idaho, 6th, 27th.

*Middle Pacific coast region.*—San Francisco, California, 5th, 18th, 24th, 27th, 28th, 31st; Cape Mendocino, California, 29th; Oakland, California, 28th.

### LUNAR HALOS.

During October lunar halos were observed in the several districts as follows:

*New England.*—1st to 4th, 8th, 26th, 29th.

*Middle Atlantic states.*—1st, 4th, 5th, 6th, 24th, 25th, 26th, 31st.

*South Atlantic states.*—1st to 7th, 24th, 26th, 28th to 31st.

*Florida peninsula.*—Key West, 5th, 29th.

*Eastern Gulf states.*—1st, 4th, 6th, 23d, 25th, 26th, 29th, 30th.

*Western Gulf states.*—1st to 4th, 6th, 24th, 28th.

*Rio Grande valley.*—Brownsville, Texas, 24th.

*Ohio valley.*—1st, 2d, 25th, 27th to 30th.

*Lower lake region.*—Cleveland, Ohio, 2d; Buffalo New York, 6th; Palermo, New York, 28th.

*Upper lake region.*—1st, 3d to 6th, 27th to 31st.

*Extreme northwest.*—Fort Buford, Dakota, 4th; Saint Vincent, Minnesota, 24th.

*Upper Mississippi valley.*—1st, 3d, 5th, 26th, 28th to 31st.

*Missouri valley.*—5th, 29th, 31st.

*Northern slope.*—27th, 29th, 30th.

*Middle slope.*—1st, 2d, 24th, 29th, 30th.

*Southern slope.*—Fort Stockton, Texas, 4th.

*Southern plateau.*—Fort Apache, Arizona, 11th.

*Middle plateau.*—Salt Lake City, Utah, 27th, 29th; Nephi, Utah, 27th.

*Northern plateau.*—Boise City, Idaho, 1st, 5th, 6th, 30th.

*North Pacific coast region.*—6th, 7th, 10th, 27th, 28th, 29th,

*Middle Pacific coast region.*—12th, 26th to 29th, 31st.

The phases of the moon during the month were: full moon, 4th, 4.54 p. m.; last quarter, 11th, 9.23 am.; new moon, 18th, 7.25 p. m.; first quarter, 26th, 11.48 a. m.; perigee, 7th, 9 a. m.; apogee, 23d, 8 a. m.

### MIRAGE.

San Francisco, California, a mirage was observed off the Berkeley shore during the afternoon of the 8th.

New London, Connecticut, a mirage was visible from 6.55 to 8.25 a. m. on the 15th.

Salina, Kansas, 23d.

Galveston, Texas, a mirage was observed at 12.49 p. m. on the 10th.

Indianola, Texas, 9th, 27th.

Marquette, Nebraska, 14th, 17th.

## MISCELLANEOUS PHENOMENA.

### SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and fifty-eight stations show 4,887 observations to have been made, of which four were reported doubtful; of the remainder, 4,883, there were 4,232, or 86.7 per cent., followed by the expected weather.

### SUN GLOWS.

The sun glows, reports of which have been published in previous REVIEWS, were as extensively observed during October as in the preceding months, the displays having the same characteristics as those heretofore described. The dates on which this phenomenon has been noted in the several states and territories by the regular and voluntary observers of the Signal Service are published below. Where the phenomenon was observed at sunrise it is so stated, and where the dates only are given they refer to the displays at sunset.

*Arizona.*—Fort Bowie, 26th.

*Arkansas.*—Lead Hill, 1st, 2d, 4th, 6th, 7th, 9th, 10th, 14th, 15th, 17th, 18th, 22d, 31st.

*California.*—College City, 21st to 25th; San Francisco, 5th, both at sunrise and sunset, and on 10th at sunset; Red Bluff, 17th to 22d; Los Angeles, 2d to 8th, 13th to 17th, 20th to 24th, 26th, 27th, 28th, 31st.

*Dakota.*—Vermilion, 13th, 14th, 15th, 18th, resembling the bright displays of last fall; Yankton, 2d, 14th, 15th; Deadwood, 30th.

*Florida.*—Archer, 4th to 7th, 14th, 15th, 16th, 18th, 24th, 31st; Manatee, 5th to 8th; Key West, 15th; Pensacola, 4th to 7th.

*Georgia.*—Forsyth, 5th; Augusta, 13th, 14th, 17th, 18th, 23d, 30th, 31st; Atlanta, 1st, 5th, 6th, 9th, 11th, 12th, 17th.

*Idaho.*—Boisé City, 15th, 20th.

*Indiana.*—Vevay, at sunset, 3d, 4th, 5th, 9th, 12th, 14th, 15th, 19th, 23d, 28th, and at sunrise, 6th, 10th, 20th, 21st; Wabash, observed on all clear days during the month.

*Iowa.*—Cedar Rapids, observed on numerous evenings during the month and in two instances the light covered the sky; Muscatine, at sunrise, 5th, 6th, 9th, 10th, 11th, 13th, 20th and at sunset, 2d, 4th, 5th, 8th, 9th, 12th, 13th, 16th, 17th, 18th, 23d; Humboldt, at sunrise, 15th, 19th, and at sunset 3d, 14th, 16th; Manchester, 2d, 5th, 8th, 11th, 12th, 15th, 16th, 17th, 18th; Ottumwa, 10th, 14th, 15th, 16th, 18th; Davenport, 17th, 31st.

*Kansas.*—Wellington, 1st to 6th, 8th to 12th, 14th to 19th, 21st to 24th, 26th, 27th, 29th, 30th, 31st; Wyandotte, 17th, 19th.

*Louisiana.*—Grand Coteau, 17th.

*Maine.*—Eastport, 1st, 2d, 5th, 20th.

*Maryland.*—Fallston, 4th, 6th; Baltimore, 5th, 9th.

*Massachusetts.*—Somerset, 6th, 10th, 19th; Taunton, 18th; Thatcher's Island, 5th, 6th, 20th.

*Michigan.*—Mottville, on numerous evenings during the month; Detroit, 8th, 9th, 12th, 17th, 19th, 20th, 24th; Escanaba, 8th, 9th, 13th, 16th; Port Huron, 2d, 5th, 17th, 19th, 23d.

*Minnesota.*—Chester, 9th, 16th, 17th, 18th; Saint Paul, 5th, 18th.

*Montana.*—Fort Shaw, 16th; the sky presenting a fiery appearance of unusual brilliancy, the display lasting for one hour after sunset; Fort Maginnis, 17th, 22d; Fort Assinaboine, 3d, 16th, 22d, 23d, 26th.

*Nebraska.*—Red Willow, 8th, 22d, 23d.

*Nevada.*—Carson City, 7th, 10th, 11th, 15th, 20th to 23d; 25th, 28th to 31st.

*New Hampshire.*—Mount Washington, 20th.

*New Mexico.*—Fort Craig, 10th, 12th, 16th, 19th, 20th, 22d, 25th, 27th, 28th.

*New York.*—North Volney, 20th; Palermo, 10th, 19th; Factoryville, 10th; Mountainville, 5th; Auburn, 20th; New York City, 9th, 10th, 25th; Rochester, 9th.

*North Carolina.*—Flat Rock, 1st, 18th, 15th.

*Ohio.*—College Hill, 13th, 14th, 31st; North Lewisburg, 8th, 9th, 10th; Portsmouth, 2d; Wauseon, 4th; New Athens, on nearly all clear days of the month; Toledo, at sunset, 4th, 6th, 9th to 15th, 17th, 23d, and at sunrise, 9th, 11th, 13th, 20th; Sandusky, 9th; Cleveland, 2d.

*Oregon.*—Albany, 16th, 19th; Portland, 15th, 16th, 19th.

*Pennsylvania.*—Fallsington, 5th, 6th, 13th, 14th, 15th, 18th, 19th, 20th; Wellsborough, 6th to 13th; Philadelphia, 26th.

*Rhode Island.*—Nayatt Point, at sunset from 1st to 15th, 17th, 19th, 20th, 22d, 24th, 26th, and at sunrise, 1st to 15th, 19th, 20th, 22d, 23d, 24th, 26th; Point Judith, 1st, 5th, 7th, 9th, 10th, 11th, 15th, 18th, 19th, 20th, 26th.

*South Carolina.*—Charleston, 4th, 6th, 7th, 15th, 16th, 17th.

*Tennessee.*—Ashwood, 4th; Nashville, 2d, 4th to 8th, 10th to 15th, 17th, 18th, 19th, 21st to 31st; Chattanooga, 1st, 2d, 6th, 8th, 14th, 18th; Memphis, 17th.

*Texas.*—Cleburne, at sunrise, 6th, 14th, 17th, and at sunset, 7th, 31st; Rio Grande City, 1st, 3d, 10th, 19th.

*Utah.*—Fort Thornburg, 24th, 25th, 27th, 28th; Salt Lake City, 17th.

*Vermont.*—Strafford, 20th.

*Virginia.*—Johnsontown, 9th to 15th, 19th; Wytheville, at sunrise and sunset on nearly every day during the month, the sunset displays being the more brilliant; Fort Myer, at sunrise, 5th, 22d, and at sunset, 4th, 5th, 6th, 9th, 10th, 14th, 15th, 20th, 21st, 23d; Norfolk, 1st, 15th; Lynchburg, 4th, 11th, 13th, 14th, 15th, 17th to 19th, 23d.

*Wisconsin.*—Sussex, at sunrise, 13th; La Crosse, 2d, 5th, 8th, 9th, 12th, 17th.

The Signal Service observer at Barnegat City, New Jersey, reports as follows concerning a phenomenon observed at that place, at 3.08 p. m. on the 26th:

On either side of the sun, and about 5° distant, were two small spots presenting the colors of the rainbow. The spots were on a horizontal plane with the sun, while in the zenith was a well defined arc, similar to the rainbow, with the convex side towards the sun. As the cirrus cloud was rapidly merging into stratus, the appearance faded away, and at the expiration of twenty minutes, it had entirely disappeared.

## SUN SPOTS.

Professor David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for October, 1884:

| Date—Oct., 1884. | No. of new | | Disappeared by solar rotation. | | Reappeared by solar rotation. | | Total No. visible. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | Gr'ps | Spots | Gr'ps | Spots | Gr'ps | Spots | Gr'ps | Spots | |
| 5, 5 p. m. | ..... | ..... | ..... | ..... | ..... | ..... | 6 | 30‡ | |
| 6, 3 p. m. | 0 | 10‡ | 2 | 3 | 0 | 0 | 4 | 30‡ | |
| 7, 4 p. m. | 1 | 10‡ | 0 | 0 | 0 | 0 | 5 | 40‡ | |
| 9, 2 p. m. | 1 | 3 | ..... | ..... | 1 | 3 | 3 | 35‡ | |
| 10, 3 p. m. | 0 | 10‡ | 0 | 0 | 0 | 0 | 2 | 40‡ | |
| 11, 9 a. m. | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 45‡ | |
| 13, 11 a. m. | 0 | 0 | 0 | 10‡ | 0 | 0 | 2 | 25‡ | |
| 15, 9 a. m. | 1 | 3 | 0 | 15‡ | 1 | 3 | 2 | 5 | |
| 15, 4 p. m. | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | |
| 17, 4 p. m. | 1 | 8‡ | 1 | 3 | 0 | 5‡ | 2 | 12‡ | |
| 19, 3 p. m. | 0 | 10‡ | ..... | ..... | 0 | 0 | 1 | 20‡ | |
| 20, 9 a. m. | 2 | 10‡ | 0 | 0 | 0 | 0 | 3 | 30‡ | |
| 20, 4 p. m. | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 30‡ | |
| 21, 2 p. m. | 1 | 2 | 0 | 0 | 1 | 2 | 4 | 30‡ | |
| 22, 10 a. m. | 1 | 3 | 0 | 0 | 1 | 3 | 5 | 35‡ | |
| 23, 10 a. m. | 1 | 5‡ | 0 | 0 | 0 | 0 | 6 | 35‡ | |
| 24, 2 p. m. | 0 | 15‡ | 0 | 0 | 0 | 0 | 6 | 50‡ | |
| 25, 3 p. m. | 0 | 0 | 1 | 5‡ | 0 | 0 | 5 | 50‡ | |
| 26, 2 p. m. | 1 | 5‡ | 0 | 0 | 0 | 0 | 6 | 55‡ | |

Faculæ were seen at the time of every observation. ‡Approximated.

The following extract is taken from "Science" of November 14th, 1884:

The long-delayed maximum of solar spots, now undoubtedly passed, has attracted unusual attention to the spot periodicity. To-day and yesterday the visible hemisphere of the sun was, for the first time in nearly fourteen months, observed to be entirely free from spots; the occasion next preceding this being 1883, September 25th. During the past two years the only additional days on which the sun was observed to be without spots were in 1882, October 9th and December 3d, and in 1883, February 23d, and May 25th, 26th, 27th, and 28th.

DAVID P. TODD.

LAWRENCE OBSERVATORY, AMHERST, MASS., *November* 8.

Mr. Louis G. Carpenter, of Lansing, Michigan, reports sun spots during October as follows:

| Date. | Time, 90th meridian. | No. of groups. | No. of sun spots. |
|---|---|---|---|
| October 2 | 4.30 p. m. | 5 | 39 |
| October 3 | 4.30 p. m. | 6 | 33 |
| October 6 | ..... | 4 | 18 |
| October 7 | 4.00 p. m. | 5 | 21 |
| October 9 | 4.00 p. m. | 3 | 12 |
| October 13 | 2.00 p. m. | 2 | 14 |
| October 14 | ..... | 3 | 7 |
| October 15 | 9.00 a. m. | 3 | 10 |
| October 17 | 4.00 p. m | 1 | 7 |
| October 18 | 1.45 p. m. | 4 | 16 |
| October 20 | 3.00 p. m. | 5 | 24 |
| October 25 | ..... | 5 | 20 |

## DROUGHT.

*Alabama.*—The following report is from the "New York Herald" of October 20, 1884:

TUSCALOOSA, *October* 19, 1884.—The effects of the unprecedented drought in Alabama have become appalling in some sections of the state. From different localities come reports that wells and streams are drying up, and it is with great difficulty that water enough for man and beast can be had. The navigable streams of the state are lower than for years before, and even the lightest draught steamers cannot ascend the Warrior and Tombigbee rivers. Many mills throughout the country have been stopped for want of water, and even forest trees are dying in some places. No rain has fallen here since August 28. Dry, parching winds sweep clouds of suffocating dust into the air, and there is no immediate prospect of relief.

Mobile: the rain on the 22d was the first that had fallen in this vicinity for twenty-eight days, and in many parts of the state no rain had fallen for months previous to the above date.

Montgomery, 23d: the severe drought in this state was partially broken in some sections by the rains of the 22d. In the vicinity of Montgomery no rain of consequence has fallen for about three months. Vegetation is dying out, and streams and wells are becoming low.

Reports from Birmingham state that the rain of the 22d ended the drought in that locality, where no rain of consequence had fallen since August 4.

*Florida.*—Cedar Keys, 23d: the continued dry weather has caused scarcity of water in this part of the state.

*Georgia.*—Atlanta: the rain on the 22d was the first sufficient to lay the dust that had fallen for seventy-three days. As a result of the severe drought the cotton crop has been cut short and farming operations delayed.

*Maryland.*—Fallston, Harford county, 30th: during the month the soil has been too dry for seeding grain; at the close of the month wells were failing and streams were very low.

*Massachusetts.*—Somerset, Bristol county, 31st: the drought of September and October, 1884, has largely reduced the yield and injured the quality of the late crops. Only 0.94 inch of rain fell during September, and from October 1st to 30th, 0.83 inch fell. Turnips, carrots, beets, etc., were checked in their growth; grass in the pastures dried up, and the streams became low, many of them drying up entirely.

*New Hampshire.*—Dover, 21st: the woolen mills at South Berwick, Maine, have shut down on account of insufficient water power. The rivers and streams in this region are very low and farmers have to drive their cattle long distances for water.

Concord: on the 23d the Merrimac river at this place reached the lowest point attained for several years.

*North Carolina.*—Scott's Hill, Pender county, 3d: the weather continues very dry and crops and pastures are suffering in consequence.

Kitty Hawk, 27th: the drought which has prevailed in this vicinity during the past two montns still continues.

Raleigh, 30th: the weather during the month was very hot and dry; the total rainfall was only 0.50 inch, and the temperature rose to 90° and above, daily, from the 1st to 17th.

*Tennessee.*—Nashville, 16th: the protracted drought continues, and though equally as prolonged as that of 1881, it has not proved as damaging in its effects, as it came about one month later. In the upper country, along the Cumberland plateau, the water courses and pastures have dried up. On the 18th, the wells in Nashville were beginning to fail. Reports from Coffee county on the 21st, stated that no rain had fallen in that vicinity since September 26th, and that the total rainfall for that month, prior to the above date, was only 0.80 inch.

Chattanooga: on the 22d 0.28 inch of rain fell, which was the first rain of any consequence that had fallen for six weeks; on the 27th, 28th, and 29th moderate rains fell in sufficient quantity to check the drought.

Ashwood, Maury county, 30th: the drought which was ended by the rains of the last days of the month had prevailed for nearly three months.

*Virginia.*—Norfolk, 21st: no rain of consequence has fallen in this vicinity since the middle of August, and agricultural interests have suffered seriously. Rain at this time would not save the crops, but would be of great benefit to pastures and in replenishing the water supply.

Petersburg, Dinwiddie county: on the 1st, owing to limited water supply, it became necessary to utilize the water in the upper Appomattox canal in order to supply the city. All of the cotton factories in this city and vicinity were closed on the 5th, in consequence of the limited water power, occasioned by long continued drought. The first rain in this vicinity for more than eight weeks fell during the night of the 22–23d.

Danville: the drought in this vicinity was terminated by the rains of the 22d.

Marion, Smyth county: no rain fell from August 29th to October 22d, during which time severe drought prevailed; on the 22d 0.40 inch of rain fell, and on the 27th and 28th the rainfall amounted to 0.70 inch, which was sufficient to end the drought.

Wytheville, Wythe county: the rainfall for the month was 0.86 inch, which was only sufficient to partially check the drought which has prevailed during this and the preceding month; at the close of the month all streams had become very low, and the cisterns were exhausted.

Variety Mills, Nelson county, 30th: the drought which prevailed in August and September has continued during October. The total rainfall for the three months is 3.03 inches, of which amount 0.96 inch fell in October.

*West Virginia.*—Helvetia, Randolph county: the weather during September and October has been dry; at the close of the latter month the streams were very low, and mills dependent on water power were idle. The drought appears to have been more severe in the southern portions of the state than in this vicinity.

### METEORS.

Prescott, Arizona: a brilliant meteor was seen at 7.10 p. m. on the 3d, shooting across the southern sky in a direction from southeast to northwest.

Rio Grande City, Texas: a brilliant meteor was observed at 7.30 p. m. on the 6th; it started from a point near the zenith, fell slowly toward the horizon, and exploded when at an altitude of 10°. During the flight of the meteor it assumed various colors; when first seen it was of bright yellow color which changed to violet, and before exploding, its centre was of bright yellow, surrounded by a band of pale blue. As the meteor moved downward it apparently increased in size; no noise was heard at its explosion. Although the moon was above the horizon and the night clear, the light from the meteor was sufficient to cast well-defined shadows. It left a small cloud, which owing to the light of the moon, was very indistinct.

Indianola, Texas: a very brilliant meteor was seen at 9 p. m. on the 6th, passing across the sky at an altitude of 20° from west-northwest to east; it was visible for nearly four seconds, and although the moon was full, it produced a light which was quite noticeable.

Burlington, Iowa: at 12.05 a. m. on the 14th, a meteor passed from the northern horizon to the zenith, leaving a long and brilliant trail. On the 18th at 12.15 a. m., a meteor was observed passing from the zenith to the northern horizon, leaving a trail 20° in length; another meteor was seen at 4.05 a. m. on the same date, at an altitude 45° in the northwestern sky, moving toward the horizon.

Grand Haven, Michigan: a brilliant meteor was observed at 7.10 p. m. of the 17th; its path was from north to south, passing about 20° east of the zenith. The meteor moved with great velocity, and when reaching a point about 30° above the southern horizon, it exploded with a loud report, and for a moment illuminated the entire sky as if by a flash of lightning. After the explosion, a small cloud was distinctly seen where the meteor disappeared.

Indianapolis, Indiana: at 10.46 p. m. of the 18th, a small, brilliant meteor passed from a point a few degrees west of the zenith, to within 40° of the western horizon.

Chattanooga, Tennessee: a small but brilliant meteor was observed in the northern sky at 7.47 p. m. on the 21st. On the 23d, at 12.12 a. m. a large meteor passed from the zenith to within about 20° of the western horizon, where it exploded into fragments, leaving a diffuse, reddish light which remained visible thirty seconds.

Somerset, Bristol county, Massachusetts: at 7.42 p. m. (eastern standard time), of the 23d, a brilliant meteor passed across the sky from east to west. The nucleus was approximately one-fourth the apparent size of the full moon, of a silvery color, with a trail 30° in length. It moved rapidly, and when about 20° above the western horizon, it exploded into from six to eight pieces, leaving a trail which remained visible nearly one minute. The meteor illuminated the entire sky during its flight. No noise was heard at its explosion.

Nashville: a large meteor was observed at 10.34 p. m. on the 24th; it was visible about four seconds during its passage from the "Milky Way," at an altitude 65° to the west by south horizon. The meteor left a trail of bluish light which remained visible for about six seconds; its path was about 85° in length.

Mr. John J. J. Cass, voluntary observer, at Allison, Decatur county, Kansas, reports having observed meteors as follows, local time being used: 4th, one at 8 p. m. and one at 11 p. m.; 14th, one at 10 p. m.; 15th, one at 4 a. m. and thirty from 7 to 10 p. m.; 16th, fifty-eight from 7.25 to 10 p. m.; 17th, fifty-six from 6.30 to 9 p. m.; 18th, nineteen from 7.40 to 9.50 p. m.; 19th, forty-five from 6.15 to 9.50 p. m., when the sky became obscured; 20th, day and night stormy; 21st, ten from 8.25 to 8.55 p. m; 22d, four from 7.30 to 9 p. m; 23d, one at 7.45 p. m.

Woodstock, Howard county, Maryland: meteors were observed as follows: 7th, four, from 7.42 to 7.44 p. m; 10th, one at 8.45 p. m. and one at 8.55 p. m.; 11th, one at 8.30 p. m.; 12th, one at 8.45 p. m.; 12th, one at 8.15 p. m. and one at 8.46 p. m.; 14th, five from 6.30 to 8.35 p. m.; 15th, one at 5.30 a. m. and one at 10.10 p. m.; 19th, one at 5.05 a. m., one at 8.30 p. m. and one at 8.45 p. m.

Meteors were also observed at the following places:

Lead Hill, Arkansas, 1st, 4th, 6th, 9th, 10th, 12th, 14th to 17th, 19th, 29th, 30th.

Deadwood, Dakota, numerous on the 25th.

Davenport, Iowa, 2d, 13th, 24th.

Liberty Hill, Louisiana, 1st, 20th.

Rowe, Massachusetts, 17th.

Genoa, Nebraska, 23d.

Red Willow, Nebraska, 8th, 12th.

Readington, New Jersey, 23d.

North Volney, New York, 13th.

Brevard, North Carolina, 13th, 15th.

Jacksonburg, Ohio, 16th, 17th.
Albany, Oregon, 23d.
East Portland, Oregon, 19th.
Fallsington, Pennsylvania, 21st.
Pittsburg, Pennsylvania, 3d.
Stateburg, South Carolina, 12th, 13th, 21st, 22d.
Wytheville, Virginia, 7th.
Variety Mills, Virginia, 9th.
Dale Enterprise, Virginia, 9th, 17th.
Sussex, Wisconsin, 16th.

PRAIRIE AND FOREST FIRES.

Richardton, Stark county, Dakota: on the 8th, prairie fires began near Knife river; during the two succeeding weeks the fires burned over an area of many square miles, causing great damage. The snow and rain during the last days of the month was sufficient to almost extinguish the fires.

Fort Sully, Dakota: on the 19th the sun was obscured all day by dense smoke from forest fires.

Huron, Dakota: during a high wind on the afternoon of the 19th, an extensive prairie fire swept over the northwestern part of this county, causing the destruction of much stacked grain, and several dwellings and barns. The wind carried the flames over the "fire-breaks" which were more than one hundred feet in width.

Fort Assinaboine, Montana: on the 13th dangerous prairie fires prevailed in this vicinity and threatened the destruction of several thousand cords of wood near the post. In some instances persons narrowly escaped with their lives and had their clothing and hair burned. Prairie fires also occurred on the 11th, 12th, 18th, 21st.

Crisfield, Somerset county, Maryland, 23d: during the past week destructive forest fires have prevailed in this county, and in Accomack and Northampton counties, Virginia.

Petersburg, Dinwiddie county, Virginia, 24th: reports from Brunswick and Greenville counties on the 24th, stated that destructive forest fires had broken out, and that much valuable timber and large quantities of undergrowth were destroyed.

Reports from Norfolk on the 5th stated that fires had broken out in the Dismal Swamp, a short distance from Norfolk, and threatened to destroy much valuable timber and cord-wood.

Marion, Smyth county, Virginia, 19th: owing to the continued fires in the mountains, the atmosphere is filled with dense smoke.

Johnsontown, Northampton county, Virginia, 31st: forest fires have been burning in this county since September 18th, and continue at the close of October.

Prairie and forest fires were also reported from the following places:

Fort Meade, Dakota, 14th, 15th.
Fort Yates, Dakota, 9th, 13th, 25th.
Fort Buford, Dakota, 11th to 19th.
Fort Totten, Dokota, 9th, 13th, 18th, 20th.
Poplar River, Montana, 12th, 14th.
Cantonment, Indian Territory, 13th.
Fort Reno, Indian Territory, 1st, 2d, 4th, 5th, 28th.
Humboldt, Iowa, 28th.
Pike's Peak, Colorado, east of station, 23d.
Saint Vincent, Minnesota, 6th, 7th, 10th to 16th, 18th, 19th, 23d, 24th, 25th,
Red Willow, Nebraska, 23d.
North Platte, Nebraska, 17th.
Vineland, New Jersey, 8th to 22d.
Cape Henry, Virginia, 8th, 13th, 16th, 17th, 19th, 26th, 28th.

MIGRATION OF BIRDS.

*Geese flying southward.*—Lead Hill, Arkansas, 23d, 25th; Little Rock, Arkansas, 27th; Red Bluff, California, 6th; Cape Mendocino, California, 9th; Vermilion, Dakota, 14th; Forts Bennett and Sully, Dakota, 24th; Cairo, Illinois, 6th; Edgington, Illinois, 13th, 25th; Logansport, Indiana, 7th; Cantonment, Indian Territory, 5th, 23d; Manchester, Iowa, 5th; Des Moines, Iowa, 20th: Fort Madison, Iowa, 26th; Maud, Kansas, 8th; Manhattan, Kansas, 17th; Independence, Kansas, 21st; Yates Centre, Kansas, 13th, 14th; Wellington, Kansas, 16th, 17th, 27th; Elk Falls, Kansas, 26th; Liberty Hill, Louisiana, 23d, 24th, 25th; Emmitsburg, Maryland, 13th; Ocean City, Maryland, 4th, 5th; Mottville, Michigan, 21st, 25th, 26th; Grand Haven, Michigan, 22d; Marquette, Michigan, 19th; Duluth, Minnesota, 15th. 17th, 21st; Moorhead, Minnesota, 16th; Saint Louis, Missouri, 22d, 25th; De Soto, Nebraska, 6th; Genoa, Nebraska, 16th; Puerto de Luna, New Mexico, 7th; Little Egg Harbor, New Jersey, 8th; Palermo, New York, 23d; Oswego, New York, 3d; Factoryville, New York, 15th; Albany, New York, 31st; Ithaca, New York, 4th; North Volney, New York, 1st, 20th; New River Inlet, North Carolina, 16th; Kitty Hawk, North Carolina, 16th; Grampian Hills, Pennsylvania, 13th; Wellsboro, Pennsylvania, 19th, 22d, 23d, 29th; Portland, Oregon, 5th, 11th, 26th; Roseburg, Oregon, 5th, 9th; Astoria, Oregon, 9th, 11th, 12th, 13th; Point Judith, Rhode Island, 6th; Charleston, South Carolina, 26th; Chattanooga, Tennessee, 15th; Memphis, Tennessee, 21st, 23d; Fort Elliott, Texas, 6th; Fort Myer, Virginia, 13th; Cape Henry, Virginia, 1st, 6th, 14th, 19th; Embarras, Wisconsin, 13th; Sussex, Wisconsin, 25th.

*Ducks flying southward.*—Fort Smith, Arkansas, 19th; Little Rock, Arkansas, 27th; Sacramento, California, 30th; Fort Sully, Dakota, 24th; Manchester, Iowa, 7th; Yates Centre, Kansas, 23d, 24th, 28th, 29th; Allison, Kansas, 5th, 8th, 30th; Liberty Hill, Louisiana, 2d, 3d, 24th, 26th; Escanaba, Michigan, 13th; Ithaca, New York, 4th; Oswego, New York, 11th; Hatteras, North Carolina, 8th, 24th; Kitty Hawk, North Carolina, 3d; Wellsboro, Pennsylvania, 19th, 22d, 23d, 29th; Indianola, Texas, 8th, 11th, 22d, 23d, 25th; Rio Grande City, Texas, 13th; Fort Myer, Virginia, 22d.

*Cranes flying southward.*—Fort Sully, Dakota, 12th; Edgington, Illinois, 27th; Yates Centre, Kansas, 21st, 26th; Allison, Kansas, 5th, 7th, 11th, 25th; West Leavenworth, Kansas, 22d; Maud, Kansas, 6th; Genoa, Nebraska, 17th; Portland, Oregon, 21st.

*Pigeons flying southward.*—Fort Smith, Arkansas, 4th; Readington, New Jersey, 2d.

At Mottville, Michigan, swans were observed flying southward on the 19th, 24th, 26th.

POLAR BANDS.

Lead Hill, Arkansas, 24th, 28th.
Archer, Florida, 10th, 11th, 17th, 23d, 26th, 29th.
Riley, Illinois, 3d, 29th.
Guttenberg, Iowa, 24th.
Eastport, Maine, 23d.
Salina, Kansas, 23d.
Yates Centre, Kansas, 29th.
Moorestown, New Jersey, 28th.
Nashville, Tennessee, 20th, 24th, 25th, 26th, 28th.
Rio Grande City, Texas, 2d, 28th.
Wytheville, Virginia, 1st, 9th, 26th.
Dale Enterprise, Virginia, 26th.
Prairie du Chien, Wisconsin, 10th.

EARTHQUAKES.

Rivas, Nicaragua, Central America, October 2d.—Two light shocks of earthquake occurred on this date, the first at 2.32 p. m., of two seconds duration, and the other after 3 p. m., of about three seconds duration.

San Juan del Sur, Nicaragua, Central America, October 3d.—A strong shock of earthquake was felt at 4 p. m. on the 2d.

Los Angeles, California.—A slight shock of earthquake was felt at 3.34 p. m. on the 22d.

The following note is from the "Danbury (Connecticut) News," (date of issue not known). The earthquake referred to was that which occurred August 10, 1884:

At Rocky Glen where all attempts to obtain water by digging wells had always failed, there has been an abundance of water since the occurrence of the earthquake. Previous to that all water used in the houses and greenhouses was brought from a long distance, necessitating much labor and ex-

*Meteorological record of voluntary observers and army post surgeons—October*, 1884.

| Station. | Temperature Mean. | Maximum. | Minimum. | Rainfall. |
|---|---|---|---|---|
| Orono, Me | 45.3 | 78 | 23 | 2.70 |
| Cornish, Me | 40.0 | 78 | 26 | 3.56 |
| Gardiner, Me | 48.2 | 74 | 28 | 3.14 |
| Antrim, N. H | ..... | ..... | ..... | 2.55 |
| Weir's Bridge, N. H | ..... | ..... | ..... | 2.42 |
| Lake Village, N. H | ..... | ..... | ..... | 2.18 |
| Bristol, N. H | ..... | ..... | ..... | 2.32 |
| Ashland, N. H | ..... | ..... | ..... | 2.79 |
| Woodstock, N. H | ..... | ..... | ..... | 4.08 |
| Belmont, N. H | ..... | ..... | ..... | 2.52 |
| Wolfborough, N. H | ..... | ..... | ..... | 2.63 |
| Charlotte, Vt | 48.2 | 72 | 29 | 4.10 |
| Burlington, Vt | 48.7 | 75 | 29 | 3.82 |
| Woodstock, Vt | 45.9 | 74 | 25 | 2.04 |
| Dorset, Vt | 46.4 | 76 | 22 | 4.69 |
| Lunenburg, Vt | 43.6 | 70 | 25 | 5.00 |
| Newport, Vt | 46.9 | 76 | 28 | 5.88 |
| Strafford, Vt | 46.2 | 74 | 26 | 1.70 |
| Williamstown, Mass | 49.4 | 73 | 25 | 2.98 |
| Dudley, Mass | ..... | 80 | 25 | 1.03 |
| Mendon, Mass | 51.1 | 78 | 29 | ..... |
| Milton, Mass | 48.8 | 78 | 32 | 2.98 |
| New Bedford, Mass | 52.1 | 78 | 29 | 1.61 |
| Somerset, Mass | 54.2 | 86 | 24 | 2.10 |
| Princeton, Mass | 47.0 | 78 | 23 | 2.99 |
| Westborough, Mass | 51.6 | 82 | 26 | 2.38 |
| Taunton, Mass | 52.8 | 86 | 26 | 2.55 |
| Heath, Mass | ..... | 74 | 22 | ..... |
| Rowe, Mass | 46.1 | 74 | 28 | 3.02 |
| Fall River, Mass | 51.4 | 79 | 27 | 2.17 |
| Worcester, Mass | 48.7 | 76 | 27 | 2.34 |
| Providence, R. I | 53.0 | 81 | 28 | 2.73 |
| Nyatt Point, R. I | ..... | 85 | 32 | 4.60 |
| Hartford, Conn | 50.8 | 81 | 24 | 2.88 |
| Southington, Conn | 50.7 | 80 | 28 | 2.85 |
| Bethel, Conn | ..... | ..... | ..... | 3.26 |
| Voluntown, Conn | ..... | 84 | 28 | 0.90 |
| Fort Hamilton, N. Y | 57.6 | 89 | 30 | 3.41 |
| Mountainville, N. Y | 52.2 | 84 | 20 | 3.48 |
| Palermo, N. Y | 47.8 | 79 | 22 | 2.65 |
| Auburn, N. Y | 51.6 | 77 | 32 | 3.38 |
| Humphrey, N. Y | 48.1 | 79 | 24 | 3.93 |
| Menand, N. Y | 51.4 | 76 | 31 | 3.00 |
| Ithaca, N. Y | 50.9 | 83 | 22 | 2.95 |
| Penn Yan, N. Y | ..... | ..... | ..... | 1.52 |
| Cooperstown, N. Y | 48.3 | 77 | 24 | 3.31 |
| North Volney, N. Y | 50.2 | 80 | 24 | 3.00 |
| Port Jervis, N. Y | 48.7 | 82 | 30 | 2.29 |
| Factoryville, N. Y | 49.6 | 80 | 22 | 2.86 |
| White Plains, N. Y | 55.2 | 85 | 25 | 3.60 |
| Fort Niagara, N. Y | 52.6 | 81 | 25 | 0.85 |
| Fort Columbus, N. Y | 56.4 | 84 | 31 | 3.36 |
| Madison Barracks, N. Y | 49.9 | 79 | 19 | 2.03 |
| Plattsburg Barracks, N.Y | 47.6 | 79 | 26 | 2.42 |
| David's Island, N. Y | 60.0 | 85 | 18 | 4.45 |
| Phillipsburg, N. J | 55.6 | 68 | 31 | 1.58 |
| Somerville, N. J | 54.3 | 82 | 28 | 2.92 |
| Readington, N. J | 59.8 | 90 | 32 | 3.40 |
| Vineland, N. J | 58.2 | 89 | 26 | 0.80 |
| Moorestown, N. J | 55.4 | 83 | 30 | 2.29 |
| Belvidere, N. J | ..... | 76 | 39 | 2.95 |
| South Orange, N. J | 54.2 | 82 | 32 | 2.90 |
| Salem, N. J | ..... | 85 | 37 | 1.34 |
| Wellsborough, Pa | 51.2 | 82 | 28 | 3.02 |
| Fallsington, Pa | 54.6 | 81 | 31 | 2.30 |
| Leetsdale, Pa | 48.3 | 75 | 23 | 2.28 |
| Grampian Hills, Pa | 51.7 | 80 | 22 | 3.76 |
| Drifton, Pa | 49.4 | 81 | 22 | 2.67 |
| Wilkesbarre, Pa | 51.6 | 82 | 23 | 3.16 |
| Troy, Pa | 48.1 | 82 | 17 | 2.67 |
| Easton (Lafayette Col.), Pa | 56.2 | 97 | 30 | ..... |
| Dyberry, Pa | 49.0 | 76 | 22 | 2.34 |
| Catawissa, Pa | 55.0 | 82 | 28 | 3.69 |
| Westchester, Pa | 54.6 | 83 | 28 | 2.56 |
| Easton, Pa | ..... | ..... | ..... | 3.96 |
| Altoona, Pa | 57.4 | 84 | 26 | 1.63 |
| Germantown, Pa | ..... | 80 | 31 | 2.22 |
| Tamaqua, Pa | 55.6 | 85 | 32 | 2.24 |
| Chambersburg, Pa | 53.5 | 84 | 30 | 2.27 |
| Franklin, Pa | 47.2 | 80 | 30 | 3.08 |
| Haverford College, Pa | ..... | 82 | 30 | 2.21 |
| Delingersville, Pa | 51.6 | 80 | 22 | ..... |
| State College, Pa | ..... | 80 | 23 | ..... |
| Cumberland, Md | 56.8 | 84 | 24 | 1.98 |
| McDonogh School, Md | ..... | 87 | 28 | 1.64 |
| Emmitsburg, Md | 54.6 | 86 | 31 | 1.55 |
| Woodstock, Md | 55.5 | 87 | 28 | 1.45 |
| Fallston, Md | 56.4 | 88 | 29 | 1.48 |
| Great Falls, Md | 59.0 | 90 | 28 | 1.73 |
| Fort McHenry, Md | 58.7 | 85 | 32 | 0.98 |
| Dale Enterprise, Va | 59.2 | 92 | 26 | 0.91 |
| Wytheville, Va | 58.4 | 86 | 25 | 0.86 |
| Variety Mills, Va | 59.1 | 91 | 25 | 0.96 |
| Accotink, Va | 61.1 | 93 | 31 | 1.42 |
| Blacksburg, Va | ..... | ..... | 23 | 0.84 |
| Fort Monroe, Va | 64.9 | 89 | 38 | 0.20 |
| Snowville, Va | ..... | 84 | 26 | ..... |
| Marion, Va | 58.5 | 88 | 24 | 1.10 |
| Summit, Va | 60.8 | 93 | 26 | ..... |
| Johnsonton, Va | 66.7 | 94 | 37 | trace |
| Washington Aqued't, D.C | 62.7 | 92 | 32 | ..... |
| Distributing Res'r, D. C | 61.2 | 89 | 34 | 1.62 |
| West Washington, D. C | ..... | ..... | ..... | 1.53 |
| Kelleys, N. C | 66.9 | 91 | 30 | 0.00 |
| Lenoir, N. C | ..... | 88 | 30 | 0.70 |
| Lincolnton, N. C | 62.3 | 83 | 42 | 0.99 |
| Raleigh, N. C | 70.0 | 93 | 42 | 0.50 |
| Flat Rock, N. C | 58.9 | 84 | 30 | 0.53 |
| Statesville, N. C | 67.1 | 91 | 34 | 0.92 |
| Weldon, N. C | 63.7 | 95 | 33 | 1.05 |
| Chapel Hill, N. C | 65.2 | 100 | 30 | 0.83 |
| Brevard, N. C | 59.9 | 92 | 25 | 0.79 |
| Statçburg, S. C | 65.0 | 94 | 36 | 0.02 |
| Milledgeville, Ga | ..... | 94 | 35 | 0.69 |
| Andersonville, Ga | 49.5 | 72 | 30 | trace |
| Forsyth, Ga | 73.8 | 100 | 38 | 0.10 |
| Athens, Ga | 67.1 | 94 | 30 | 0.51 |
| Quitman, Ga | ..... | 95 | 44 | 0.40 |
| Manatee, Fla | 78.9 | 84 | 61 | 3.66 |
| Archer, Fla | 73.9 | 91 | 51 | 0.29 |
| Mayport, Fla | 70.5 | 87 | 61 | 3.51 |
| Tallahassee, Fla | 68.5 | 94 | 44 | ..... |
| Limona, Fla | 74.3 | 93 | 52 | 0.96 |
| Saint Augustine, Fla | 73.4 | 86 | 53 | 1.05 |
| Green Springs, Ala | 68.4 | 93 | 34 | 2.41 |
| Mt. Vernon B'ks, Ala | 74.1 | 98 | 36 | 5.76 |
| Birmingham, Ala | ..... | 92 | 30 | ..... |
| Point Pleasant, La | 68.6 | 92 | 39 | 0.44 |
| Liberty Hill, La | ..... | 87 | 40 | ..... |
| Luling, La | ..... | 90 | 48 | 6.26 |
| Grand Coteau, La | 72.5 | 89 | 46 | 3.81 |
| Monroe, La | 67.8 | 92 | 38 | 0.67 |
| Lake Providence, La | 68.2 | 96 | 26 | 0.60 |
| Delta, La | 65.7 | 92 | 28 | 0.85 |
| Saint Joseph, La | 68.0 | 92 | 41 | 1.50 |
| Vidalia, La | 71.7 | 93 | 43 | 1.18 |
| Minden, La | 68.5 | 95 | 41 | 1.02 |
| Nachitoches, La | 68.7 | 88 | 45 | 1.90 |
| Alexandria, La | 70.0 | 94 | 44 | 3.45 |
| Cheneyville, La | 70.2 | 91 | 41 | 3.25 |
| Red River Landing, La | 69.9 | 91 | 43 | 3.84 |
| Whiteville, La | 71.0 | 91 | 44 | 6.70 |
| Opelousas, La | 71.8 | 91 | 45 | 2.59 |
| La Fayette, La | 71.8 | 91 | 45 | 4.10 |
| New Iberia, La | 74.5 | 97 | 48 | 6.55 |
| Franklin, La | ..... | ..... | ..... | 7.90 |
| Thibodeaux, La | 72.5 | 90 | 45 | 6.12 |
| Donaldsonville, La | 71.6 | 91 | 46 | 2.80 |
| Baton Rouge, La | 70.6 | 92 | 44 | 2.70 |
| Clinton, La | 71.0 | 92 | 42 | 3.99 |
| Amite City, La | 72.0 | 96 | 41 | 5.02 |
| Point a la Hache, La | 73.9 | 90 | 51 | 6.30 |
| Port Eads, La | 70.9 | 87 | 61 | 7.35 |
| Cleburne, Tex | 65.7 | 89 | 41 | 2.01 |
| New Ulm, Tex | 69.5 | 90 | 50 | 1.78 |
| Clarksville, Tex | 67.3 | 90 | 45 | 1.45 |
| Fort Concho, Tex | 67.1 | 95 | 42 | 4.16 |
| Austin, Tex | 70.8 | 88 | 50 | 2.63 |
| Mount Ida, Ark | 63.0 | 89 | 32 | 0.70 |
| Lead Hill, Ark | 63.2 | 97 | 31 | 0.94 |
| Fayetteville, Ark | ..... | 85 | 32 | 2.17 |
| Wellsburg, W. Va | ..... | ..... | ..... | 3.20 |
| Helvetia, W. Va | 50.4 | 88 | 26 | 2.45 |
| Milan, Tenn | 62.3 | 93 | 27 | 2.82 |
| Austin, Tenn | 65.7 | 94 | 30 | 2.71 |
| Ashwood, Tenn | 61.0 | 91 | 28 | 2.40 |
| Richmond, Ky | 60.0 | 88 | 30 | 2.29 |
| Frankfort, Ky | 60.2 | 89 | 27 | 1.64 |
| Ruggles, Ohio | 53.6 | 84 | 33 | 1.45 |
| Cincinnati, Ohio | 61.0 | 92 | 29 | 1.25 |
| Margaretta, Ohio | 59.5 | 83 | 31 | 1.06 |
| Jacksonburg, Ohio | 57.8 | 95 | 28 | 1.15 |
| Quaker City, Ohio | 58.2 | 82 | 20 | 1.91 |
| Hiram, Ohio | 52.7 | 82 | 29 | 2.83 |
| New Athens, Ohio | 55.0 | 83 | 25 | 2.39 |
| Canton, Ohio | 53.3 | 85 | 24 | 2.89 |
| Cleveland, Ohio | 55.1 | 82 | 30 | 1.87 |
| Westerville, Ohio | 53.9 | 86 | 23 | 1.20 |
| North Lewisburg, Ohio | 60.5 | 87 | 25 | 1.05 |
| Warren, Ohio | 52.7 | 83 | 23 | 2.71 |
| College Hill, Ohio | 62.3 | 90 | 41 | 2.70 |
| Wooster, Ohio | 54.6 | 86 | 22 | 1.48 |
| Wauseon, Ohio | 53.2 | 88 | 18 | 3.01 |
| Portsmouth, Ohio | 58.1 | 89 | 26 | 1.22 |
| Garrettsville, Ohio | 53.6 | 86 | 29 | 2.56 |
| Oberlin, Ohio | 53.4 | 83 | 26 | 1.24 |
| Dayton, Ohio | 57.6 | 86 | 24 | 1.17 |
| New Bremen, Ohio | 57.8 | 86 | 26 | 1.19 |
| Sidney, Ohio | 54.2 | 88 | 22 | 1.83 |
| Junction, Ohio | 52.6 | 85 | 22 | 5.14 |
| Lebanon, Ohio | 59.4 | 91 | 24 | 1.51 |
| Levering, Ohio | 53.1 | 86 | 22 | 1.73 |
| Gambier, Ohio | 52.6 | 82 | 23 | 2.47 |
| Ironton, Ohio | 60.1 | 99 | 19 | 1.44 |
| Washington C. H., Ohio | 57.9 | 91 | 23 | 1.78 |
| Waverly, Ohio | 58.0 | 90 | 23 | 1.05 |
| Logan, Ohio | 58.7 | 93 | 18 | 2.73 |
| Marietta, Ohio | 57.5 | 89 | 26 | 1.17 |
| McConnelsville, Ohio | 55.0 | 92 | 22 | 1.13 |
| Pomeroy, Ohio | 60.4 | 88 | 23 | 1.15 |
| Granville, Ohio | 56.9 | 87 | 24 | 1.23 |
| Lafayette, Ind | 52.5 | 86 | 25 | 2.54 |
| Fort Wayne, Ind | 56 0 | 93 | 30 | 3.40 |
| Logansport, Ind | 59.2 | 90 | 30 | 3.26 |
| Laconia, Ind | 60.5 | 89 | 27 | 2.00 |
| Terre Haute, Ind | ..... | 81 | 30 | 1.59 |
| Sunman, Ind | 57.0 | 86 | 24 | 1.04 |
| Jeffersonville, Ind | 60.6 | 88 | 28 | 1.81 |
| Spiceland, Ind | 55.9 | 89 | 24 | 1.81 |
| Vevay, Ind | 62.3 | 90 | 27 | 0.95 |
| Wabash, Ind | 56.7 | 83 | 31 | 3.75 |
| Monticello, Ind | 56.6 | 84 | 33 | 4.82 |
| Farnkfort, Ind | 54.9 | 80 | 32 | 3.88 |
| Connersville, Ind | 55.3 | 87 | 28 | 2.08 |
| Noblesville, Ind | 57.8 | 81 | 32 | 2.97 |
| Greenfield, Ind | 55.6 | 87 | 30 | ..... |
| Franklin, Ind | 56.2 | 89 | 30 | 1.62 |
| Martinsville, Ind | 55.7 | 89 | 24 | 1.07 |
| Fillmore, Ind | ..... | ..... | ..... | 1.30 |
| Farmland, Ind | 56.2 | 86 | 30 | 0.73 |
| Mauzy, Ind | 50.8 | 84 | 27 | 2.67 |
| Romney, Ind | 55 9 | 87 | 21 | 4.67 |
| Dana, Ind | 55.8 | 91 | 32 | 3.73 |
| Richmond, Ind | 56.0 | 89 | 28 | 1.91 |
| Columbus, Ind | 59.1 | 95 | 27 | 2.19 |
| Blue Lick, Ind | 61.4 | 90 | 31 | 2.31 |
| Huntingburg, Ind | 62.0 | 87 | 30 | 1.87 |
| Princeton, Ind | 58.2 | 90 | 28 | 1.60 |
| Worthington, Ind | 58.1 | 86 | 25 | 1.82 |
| Bloomington, Ind | 58.1 | 86 | 25 | ..... |
| Degonia Springs, Ind | 60.5 | 90 | 28 | 2.21 |
| Salem, Ind | 58.7 | 87 | 25 | 1.29 |
| Corydon, Ind | 61.0 | 89 | 24 | 1.10 |
| Mitchell, Ind | 59.0 | 92 | 29 | ..... |
| Tipton, Ind | 53.7 | 94 | 32 | ..... |
| Mattoon, Ill | 57.0 | 93 | 30 | 2.80 |
| Sycamore, Ill | 51.3 | 82 | 22 | 5.76 |
| Sandwich, Ill | 55.1 | 84 | 29 | 4.95 |
| Wilton Centre, Ill | 54.9 | 87 | 25 | 5.45 |
| Peoria, Ill | 59.1 | 90 | 29 | 4.80 |
| Collinsville, Ill | 60.4 | 87 | 32 | 1.64 |
| Anna, Ill | 64.6 | 89 | 32 | 1.42 |
| Rockford, Ill | 53.2 | 83 | 26 | 6.24 |
| Riley, Ill | 51.5 | 81 | 24 | 3.85 |
| Mascoutah, Ill | 64.2 | 90 | 33 | 1.91 |
| Hudson, Mich | 53.1 | 86 | 21 | 3.68 |
| Hillsdale, Mich | ..... | 83 | 23 | 3.48 |
| Ionia, Mich | 50.6 | 83 | 25 | 4.30 |
| Marshall, Mich | ..... | 84 | 32 | 3.67 |
| Northport, Mich | ..... | 80 | 30 | 1.24 |
| Traverse City, Mich | ..... | 81 | 26 | 5.74 |
| Kalamazoo, Mich | ..... | 81 | 32 | 2.88 |
| Thornville, Mich | 53.1 | 84 | 27 | 5.34 |
| Fort Brady, Mich | 46.6 | 76 | 18 | 4.35 |
| Lansing, Mich | 53.5 | 85 | 27 | 6.91 |
| Manitowoc, Wis | 51.3 | 84 | 24 | 5.03 |
| Wausau, Wis | 47.7 | 80 | 20 | 4.31 |
| Embarras, Wis | 51.7 | 85 | 25 | 7.85 |
| Sussex, Wis | 50.9 | 82 | 24 | 3.01 |
| Franklin, Wis | ..... | ..... | ..... | 4.24 |
| Beloit, Wis | 52.0 | 84 | 24 | 3.96 |
| Neillsville, Wis | 43.7 | 74 | 13 | 4.00 |
| Lancaster, Wis | ..... | 84 | 17 | 3.35 |
| Madison, Wis | 51.5 | 80 | 26 | 4.60 |
| Prairie du Chien, Wis | 51.8 | 86 | 25 | 2.80 |
| Minneapolis, Minn | 48.4 | 90 | 18 | 3.08 |
| Northfield, Minn | 49.3 | 82 | 18 | 3.45 |
| Fort Snelling, Minn | 49.5 | 85 | 19 | 2.37 |
| Chester, Minn | ..... | 82 | 17 | 3.47 |
| Monticello, Iowa | 51.8 | 85 | 17 | 3.19 |
| Des Moines (near) Iowa | 55.7 | 87 | 21 | ..... |
| Independence, Iowa | ..... | 78 | 26 | 2.10 |
| Ottumwa, Iowa | 50.7 | 91 | 27 | 5.54 |
| Manchester, Iowa | 53.6 | 85 | 24 | 2.48 |
| Logan, Iowa | 53.7 | 80 | 28 | 4.40 |
| Ranch Grove, Iowa | ..... | 86 | 28 | ..... |
| Oskaloosa, Iowa | ..... | 85 | 22 | ..... |
| Cresco, Iowa | 49.0 | 83 | 17 | 2.83 |
| Cedar Rapids, Iowa | ..... | 80 | 24 | ..... |
| Fort Madison, Iowa | ..... | 85 | 27 | 5.40 |
| Guttenberg, Iowa | 52.2 | 88 | 22 | 2.78 |
| Muscatine, Iowa | 55.8 | 87 | 24 | 6.46 |
| Maynard, Iowa | 47.6 | 81 | 16 | ..... |
| Humboldt, Iowa | 49.6 | 84 | 18 | 3.96 |
| Mount Vernon, Iowa | 56.9 | 87 | 29 | ..... |
| De Soto, Nebr | 54.7 | 88 | 25 | 4.52 |
| Fremont, Nebr | 48.7 | 83 | 25 | 2.72 |
| Genoa, Nebr | 54.8 | 86 | 24 | 2.80 |
| Tecumseh, Nebr | 62.3 | 88 | 32 | 3.03 |
| Crete, Nebr | 55.7 | 85 | 26 | 3.80 |
| Marquette, Nebr | ..... | 83 | 35 | 2.17 |
| Fort Robinson, Nebr | 53.6 | 87 | 14 | 0.34 |
| Red Willow, Nebr | 57.0 | 88 | 20 | 0.73 |
| Stockham, Nebr | 68.4 | 88 | 46 | 2.35 |
| Falls City, Nebr | 59.2 | ..... | ..... | 2.27 |
| Syracuse, Nebr | 58.4 | ..... | ..... | 2.40 |
| Weeping Water, Nebr | 56.5 | ..... | ..... | 1.74 |
| Central City, Nebr | 54.8 | ..... | ..... | 2.50 |
| DeWitt, Nebr | 56.1 | ..... | ..... | 2.50 |
| Stromsburg, Nebr | 56.2 | ..... | ..... | 2.64 |
| Table Rock, Nebr | 55.7 | ..... | ..... | 2.30 |
| Superior, Nebr | 58.7 | ..... | ..... | 1.74 |
| Sargent, Nebr | 50.9 | ..... | ..... | 0.32 |
| Neligh, Nebr | 50.2 | ..... | ..... | 1.27 |
| Ashland, Nebr | ..... | ..... | ..... | 6.05 |
| Keen, Nebr | 65.2 | ..... | ..... | 2.45 |
| Beaver Creek, Nebr | 64.5 | ..... | ..... | 1.38 |
| Fairbury, Nebr | 64.0 | ..... | ..... | 2.26 |
| York, Nebr | 60.5 | ..... | ..... | 3.43 |
| Conception, Mo | 56.8 | 83 | 29 | 2.92 |
| Carthage, Mo | 62.1 | 87 | 35 | ..... |
| Greenfield, Mo | 61.0 | 92 | 30 | 2.50 |
| Springfield, Mo | 59.9 | 96 | 30 | 1.73 |
| Centreville, Mo | ..... | 92 | 18 | 0.43 |
| Chamois, Mo | 60.9 | 89 | 30 | 1.84 |
| Dresden, Mo | 58.2 | 89 | 26 | 3.85 |
| Glasgow, Mo | 58.5 | 87 | 30 | 4.85 |
| Ironton, Mo | 59.5 | 90 | 33 | 0.95 |
| Kirkville, Mo | 50.9 | 88 | 24 | 3.96 |
| Lexington, Mo | 58.3 | 83 | 33 | 4.50 |
| Louisiana, Mo | 57.4 | 86 | 30 | 1.82 |
| Mexico, Mo | ..... | 86 | 29 | 1.72 |
| Miami, Mo | 60.0 | ..... | ..... | 5.09 |
| Oregon, Mo | 58.9 | 85 | 29 | 3.26 |
| Pleasant Hill, Mo | ..... | ..... | ..... | 4.15 |
| Sedalia, Mo | ..... | 90 | 29 | 2.81 |
| Steelville, Mo | ..... | ..... | ..... | 1.53 |
| Hanibal, Mo | ..... | ..... | ..... | 3.10 |
| Phelps City, Mo | 58.6 | 91 | 30 | 1.80 |
| Savannah, Mo | ..... | ..... | ..... | 3.95 |
| Saint Charles, Mo | ..... | ..... | ..... | 2.00 |
| Shebina, Mo | ..... | ..... | ..... | 2.10 |
| Atchison, Kans | 58.7 | 88 | 30 | 2.90 |
| Independence, Kans | 60.8 | 91 | 32 | 4.22 |
| Manhattan, Kans | 59.4 | 90 | 30 | 2.48 |
| Wyandotte, Kans | 57.5 | 86 | 29 | 4.07 |
| Salina, Kans | 60.9 | 79 | 41 | 0.09 |
| Yates Centre, Kans | 58.8 | 89 | 31 | 3.83 |
| Clay Centre, Kans | 58.9 | 87 | 31 | 2.24 |
| W. Leavenworth, Kans | 59.0 | 86 | 32 | 5.00 |
| Maud, Kans | ..... | 88 | ..... | 0.78 |
| Wellington, Kans | 60.6 | 92 | 31 | 2.90 |
| Allison, Kans | 54.0 | 89 | 19 | 1.50 |
| Lawrence, Kans | 57.9 | 85 | 31 | 2.38 |
| Elk Hill, Kans | ..... | 65 | 44 | 3.00 |
| Holton, Kans | ..... | 90 | 26 | 3.12 |
| Richardton, Dak | 46.2 | 80 | 8 | 0.70 |
| Fort Yates, Dak | 47.7 | 89 | 11 | 0.39 |
| Fort Buford, Dak | 45.5 | 86 | 11 | 0.12 |
| Fort Totten, Dak | 42.6 | 85 | 12 | 69.8 |
| Fort Sisseton, Dak | 46.3 | 78 | 12 | 3.63 |
| Fort Sully, Dak | 53.9 | 90 | 19 | 1.04 |
| Fort Randall, Dak | 54.4 | 89 | 18 | 0.97 |
| Fort A. Lincoln, Dak | 45.9 | 80 | 10 | 1.20 |
| Fort Meade, Dak | 48.7 | 86 | 13 | 0.75 |
| Webster, Dak | 52.3 | 88 | 0 | 5.09 |
| Vermilion, Dak | ..... | 89 | 20 | 2.18 |
| Pueblo, Colo | 54.2 | 80 | 23 | trace |
| Fort Lewis, Colo | 46.3 | 70 | 20 | 2.10 |
| Fort Lyon, Colo | 57.2 | 89 | 27 | 0.79 |
| Fort Lowell, Ariz | 70.9 | 98 | 41 | 1.22 |
| Tucson, Ariz | ..... | ..... | ..... | 2.24 |
| Fort Keogh, Mont | 48.1 | 87 | 11 | 0.14 |
| Fort Ellis, Mont | 44.5 | 81 | 18 | 1.38 |
| Fort Shaw, Mont | 47.7 | 80 | 21 | 0.39 |
| Fort Assinaboine, Mont | 47.1 | 85 | 10 | 0.41 |
| Fort Fred Steele, Wyo | 45.3 | 70 | 9 | 0.68 |
| Fort Bridger, Wyo | 42.7 | 75 | 15 | 0.13 |
| Puerto de Luna, N. Mex | 58.7 | ..... | ..... | 1.04 |
| Fort Wingate, N. Mex | 53.4 | 76 | 24 | 1.66 |
| Nephi, Utah | 46.1 | 77 | 22 | 2.05 |
| Carson City, Nev | 48.6 | 77 | 22 | 0.22 |
| Fort McDermit, Nev | 46.3 | 77 | 25 | 1.05 |
| Poway, Cal | 59.5 | 87 | 41 | 0.24 |
| Fall Brook, Cal | 60.1 | 92 | 40 | 0.53 |
| Cahuenga Valley, Cal | ..... | ..... | ..... | 0.51 |
| Princeton, Cal | 63.0 | 84 | 44 | 1.10 |
| Salinas, Cal | 50.6 | 84 | 57 | 1.79 |
| Oakland, Cal | 56.4 | 75 | 41 | 2.80 |
| College City, Cal | 61.7 | 86 | 48 | 0.29 |
| Sacramento, Cal | 56.8 | 80 | 37 | 1.85 |
| Alcatraz Island, Cal | 55.2 | 68 | 47 | 0.97 |
| Angel Island, Cal | 58.0 | 83 | 47 | 2.71 |
| Benicia Barracks, Cal | 60.4 | 78 | 47 | 1.07 |
| Fort Bidwell, Cal | 52.4 | 78 | 25 | 0.73 |
| Fort Gaston, Cal | 54.0 | 76 | 34 | 1.08 |
| Presidio of S. F., Cal | 55.2 | 77 | 43 | 2.18 |
| Fort Mason, Cal | 58.2 | 76 | 47 | 0.94 |
| Eola, Oreg | 51.4 | 68 | 37 | 2.80 |
| Brandon, Oreg | ..... | ..... | ..... | 3.12 |
| Albany, Oreg | 52.5 | 72 | 34 | 2.85 |
| East Portland, Oreg | ..... | 68 | 38 | 3.14 |
| Fort Klamath, Oreg | 41.6 | 78 | 11 | 1.22 |
| Pleasant Grove, Wash. T | ..... | 70 | 17 | 0.71 |
| Bainbridge Isl'd, Wash. T | 49.0 | 65 | 33 | 6.20 |
| Fort Spokane, Wash. T | 46.6 | 71 | 24 | 1.18 |
| Fort Townsend, Wash. T | 49.8 | 64 | 33 | 2.14 |
| Ainsworth, Wash. T | ..... | 75 | 34 | 0 56 |

pense. The stream has continued unabated in quantity, and is of excellent quality.

**The following notes, relating to the earthquake of September 19th, were not received until after the publication of the REVIEW for that month, and show that the area affected by the shock extended about one hundred and fifty miles farther eastward than was determined from the reports previously received:**

Professor Robinson of Howard University, Washington, District of Columbia, reports that he was sitting in his office writing when he felt a shock; he immediately noticed that the ink in his stand was waving, and also that one of the doors in the room just ajar thumped several times. He found on inquiry, that while several persons in the building had noticed nothing peculiar, yet one had felt the shock. He also found a lady in an adjacent building who had felt the shock, and, moreover, some workmen in the tunnel near the University had noticed the rumble and supposed it was made by a part of the wall caving in behind them. The time of the shock was, approximately, 3.20 p. m., eastern standard time.

It is also reported that the earthquake of September 19th, was felt by the workmen on the top of the Washington Monument (at that time about five hundred feet high); and by persons in upper stories of the Quartermaster's building.

### SAND STORMS.

**Maricopa, Arizona, 1st: during the morning the fresh westerly winds filled the air with clouds of sand and dust. At times it was impossible to see objects fifteen paces distant, and persons out of doors could breath only with difficulty. Everything in the office building was covered with sand, and telegraphic communication was interfered with on account of the fine sand working into the bearings of the instruments.**

**A sand-storm also occurred at Los Angeles, California on the 1st.**

### WATER SPOUTS.

**Galveston, Texas: at about 10.30 a. m. on the 19th, a waterspout was observed east of this place, passing in a northerly direction. It moved slowly for some distance and then broke, the cloud above it assuming a common appearance.**

### ERRATA.

**In the September REVIEW on page 227, near the bottom of the second column, the tornado published as having occurred near Alton, Pennsylvania, and moved southwestward, should read *occurred at Alton*, and *moved northeastward*.**

**On page 238, September REVIEW, second column, under "Water Spouts," Washington Observatory, should read Washburne Observatory. The water spout there referred to occurred on September 10th, the date having been omitted in that REVIEW.**

### NOTES AND EXTRACTS.

**The following extract is from the October report of the "Ohio Meteorological Bureau," under direction of Professor T. C. Mendenhall:**

The mean atmospheric pressure for the month does not differ materially from that of October, 1883. It was about one-tenth of an inch greater than that of the previous month, but the range was less than in September or in October, 1883.

The most noticeable feature of the weather was the unusually high temperature reported from many stations during the first few days of the month. Seven observers recorded a maximum of over 90° and the highest being 99° at Ironton, on the 1st, which is the maximum reported to the bureau from the beginning. The highest temperature reported during the year ending October 31, 1883, was 98°. The mean temperature for the month, 56°.3, was 3° higher than that for October, 1883, and 4° higher than the normal for the month.

The month was also remarkable for the small rainfall, being about two-thirds of the normal amount.

*State summary.*

Atmospheric pressure: mean for the state 30.14; highest barometric reading, 30.55, at Marietta, on the 15th; lowest barometric reading, 29.74, at Wauseon, on the 8th; monthly barometric range, for the state, 0.82; station reporting greatest monthly range, Wauseon, 0.80; station reporting least monthly range, Ironton, 0.43. All stations report the lowest barometric readings on the 8th, and the highest were recorded on either the 14th or 15th.

Temperature: monthly mean for the state, 56°.3; station reporting highest monthly mean, Cincinnati, 61°.3; stations reporting lowest monthly mean, Junction and Gambier, 52°.6; station reporting maximum temperature, Ironton, 99° on 1st; station reporting minimum temperature, Wauseon, 18° on 24th; monthly range of temperature for the state, 81°; station reporting greatest monthly range of temperature, Ironton, 80°; station reporting least monthly range of temperature, Cleveland, 52°.5; station reporting greatest daily range of temperature, Ironton, 48° on 16th; station reporting least daily range of temperature, Sandusky, 3°.4 on the 14th.

Relative humidity: monthly mean for the state, 75.6 per cent.; station reporting highest monthly mean, Ohio State University, 83.3 per cent.; station reporting lowest monthly mean, Cincinnati, 67.9 per cent.

Precipitation: average for the state, 1.88 inches; station reporting largest monthly rainfall, Junction, 5.14 inches; station reporting least monthly rainfall, McConnelsville, 1.13 inches.

Wind: prevailing direction for the state, SW.

NOTE.—The above summary is based on the reports from thirty-four stations.

**The following extract is from the October report of the "Alabama Weather Service," Professor P. H. Mell, director.**

AGRICULTURAL AND MECHANICAL COLLEGE,
*Auburn, Alabama, November* 1, 1884.

The drought which began in August and extended through September, continued also through October until the last week. Streams and wells dried up, causing much suffering for man and beast, especially in northern, central, and eastern Alabama. A number of cotton gins suspended work in September for want of water power from the streams, and in this month steam gins have been inconvenienced by failing wells. The 22d was the first day of general showers; and gentle rains fell also from the 26th to the 29th. No violent rains have fallen, and the suffering for water is not yet relieved.

The precipitation along the coast was normal, but there was a gradual deficiency proceeding northward; and in northern and eastern Alabama the rainfall was below the average, two inches and upward. The precipitation for the whole state for the past three months, August, September and October, was seven inches below the normal.

The first week of the month was very warm. A number of stations report the highest temperature of the season during that period. On the 9th a "cold wave" was predicted by the Chief Signal Officer, "a fall of from fifteen to twenty degrees in twenty-four hours." This was verified with remarkable accuracy in the entire western portion of the state, and partially verified in the eastern portions as there was a fall of three or four degrees. The temperature gradually decreased from this date until the 16th when the first frost is reported, a slight frost visible only in low grounds and wet places. The temperature then rose immediately and very rapidly, all stations giving the 17th as the day of greatest range of thermometer. After the showers of the 22d a second frost occurred on the 24th and another on the 25th. Those two frosts were heavy in north Alabama; in other sections the mercury in several places fell below freezing, and the first ice of the autumn was reported. But the damage was confined principally to the low grounds, as the earth and air were still too dry to be greatly affected by the cold.

The temperature rose slowly after these frosts, and the weather remained mild and showery to the close of the month. The 27th and the 28th were the days of the least range of temperature showing it to be nearly stationary.

The average temperature of the state exceeded the normal by 40°.

No rain of importance fell until the 22d.

**The "Louisiana State Weather Service," under the direction of Mr. Robert S. Day, furnishes the following report for October, 1884:**

The weather continued very warm, almost at summer heat, until the 23d, when a cold wave entered the state from the northwest travelling rapidly, with a fall in temperature of 22° to 25°, as far as the Atchafalaya, east of which it traveled less rapidly, a drop of 16° to 20° being established on the 24th. The greatest cold prevailed in the northeastern parishes, frost being general in that section, and vegetation being killed or checked. Below New Orleans the wave was but little felt, reporting 61° at Port Eads as lowest point. In the southwest portion of the state warm weather returned on the 26th and 27th, with easterly winds and rain, but this weather appears to have been confined to the Gulf shore and lower swamp country. Elsewhere the cool weather prevailed. High winds have been general. Good rains have fallen in the southern portion of the state, but the northern parishes are still far below the average.

*State summary.*

Mean temperature for October, 1884, 70°.8; highest temperature, Franklin, 7th and 8th, 99°.0; lowest temperature, Delta, 24th, 28°.0; greatest daily range, Delta, 19th, 46°.8; least daily range, Vidalia, 9th and 10th, 1°.0.

Average rainfall, 3.61 inches; greatest daily rainfall, 5.81 inches, New Iberia, 26th; greatest rainfall for month, 7.90 inches, Franklin; rainfall since January 1st, 48.87; average rainy days, 5.

Light frost at Delta, 24th. Very high northerly winds on the 9th, 10th, 22d, 25th.

Lunar halos: Port Eads, 3d; New Orleans, 26th, 29th; Shreveport, 3d.

Thunderstorms and lightning: Port Eads, 2d, 20th 21st, 27th. Lightning observed at Port Eads, 6th, 11th, 12th, 18th, 22d, 23d. Port Eads, strong winds 1st, 3d, 5th, 21st, 26th, 30th; squall and light gale on 4th, 20th, 24th. These winds ranged from northeast to southeast.

Thunderstorm: New Orleans, 2d, 21st, 26th.

Lightning: New Iberia, 2d, 19th; very high winds 23d, 24th, 29th.

REPORT OF THE MISSOURI WEATHER SERVICE, OCTOBER, 1884.

At the central station the temperature of the month of October has been 62°.8, which is 6°.7 above the normal. The extremes of temperatures were 33°.0 on the 23d and 88°.5 on the 6th, the month being remarkable for its uniform temperature.

In former years the temperature has fallen to the freezing point as early as October 4th (in 1836) and has fallen as low as 19°.5 on the 31st (1863). The highest maximum ever observed was 91°, in 1867. The temperature has never before been known to rise above 88°.5 after the 5th of October.

In the state the lowest minimum temperature reported was 18°.5, at Centreville, on the 24th. The minimum temperatures of a majority of the stations range from 28° to 32°, Lexington, Ironton, and Saint Louis reporting 33°, and being the only Missouri stations reporting where the temperature was not down to the freezing point. Mascoutah, Illinois, also reports a minimum of 33°, and at Cairo, Illinois, the minimum was 38°. The highest maximum observed was 92°, at Centreville and Greenfield.

The rainfall at the central station was 1.86 inches, the signal office, however, reporting 2.48 inches, the greater fall being caused by a local difference in the rain of the 4th. The normal fall for October is 3.05 inches. In the state the maximum fall of over 4 inches occurred west of a line drawn near Harrisonville, Glasgow, Chilicothe, and Atchison, Kansas. From this region the fall diminishes to 1.8 inches in the northwest and southeast.

The first killing frost in the state was observed on the 22d, and was reported from Sedalia and Phelps City. On the 23d killing frost was also observed at Chamois, Louisiana, Mexico, Ironton, Centreville, and Glasgow. In Saint Louis tender plants like the castor oil bean were unharmed at the close of the month.

Lexington reports: "immense flights of brown butterflies moving south on the 9th. The wet weather of September and October has delayed the sowing of wheat and has diminished the acreage. Corn in shock and wheat in stack have been badly damaged by excessive moisture."

Chamois reports: "wheat looking as well as I ever saw, with no damage by the Hessian fly. Corn crop extra good."

F. E. NIPHER,
*Director.*

**The following is an extract from the October report of the "Nebraska Weather Service," under direction of Professor Goodwin D. Swezey, of Doane College, at Crete.**

The weather during the month has been rather warmer than the average for October, with the rainfall about normal. The average rainfall in the different sections of the state, is as follows:

Northeast section, 3.48 inches; southeast section, 2.77 inches; northwest section, 2.15 inches; southwest section, 3.23 inches. Greatest number of rainy days, 9, at Fremont; least number of rainy days, 3, at Superior; average number of rainy days, 5.9.

**Professor W. H. Ragan, of Greencastle, Indiana, furnishes the following meteorological summary for the state, with accompanying remarks:**

| Districts. | Temperature. | | | | Precipitation. | |
|---|---|---|---|---|---|---|
| | Highest. | Lowest. | Monthly mean. | Departure from normal. | October, 1884. | Departure from normal. |
| | ° | ° | ° | ° | | |
| Northern counties..... | 90 | 30 | 56.4 | + 2 | 3.83 | +2.50 |
| Central counties..... | 94 | 21 | 55.8 | + 1 | 2.24 | 0.00 |
| Southern counties..... | 95 | 24 | 59.9 | + 3 | 1.85 | +2.40 |
| State..... | 95 | 21 | 57.4 | + 2 | 2.64 | ..... ..... |

The mean temperature for the whole state was about two degrees above the normal. The first fourth of the month was warm and the last fourth was cold. The lowest temperatures in the southern counties were associated with the cold wave of the 23d and 24th.

The rainfall for the state was about the normal amount, but it was very unevenly distributed—ranging from 0.73 inch in Randolph county to 4.82 inches in White county.

Frosts were reported on the 9th, 10th, 15th, 23d, and 24th; on the two latter dates killing frosts were reported from nearly all counties.

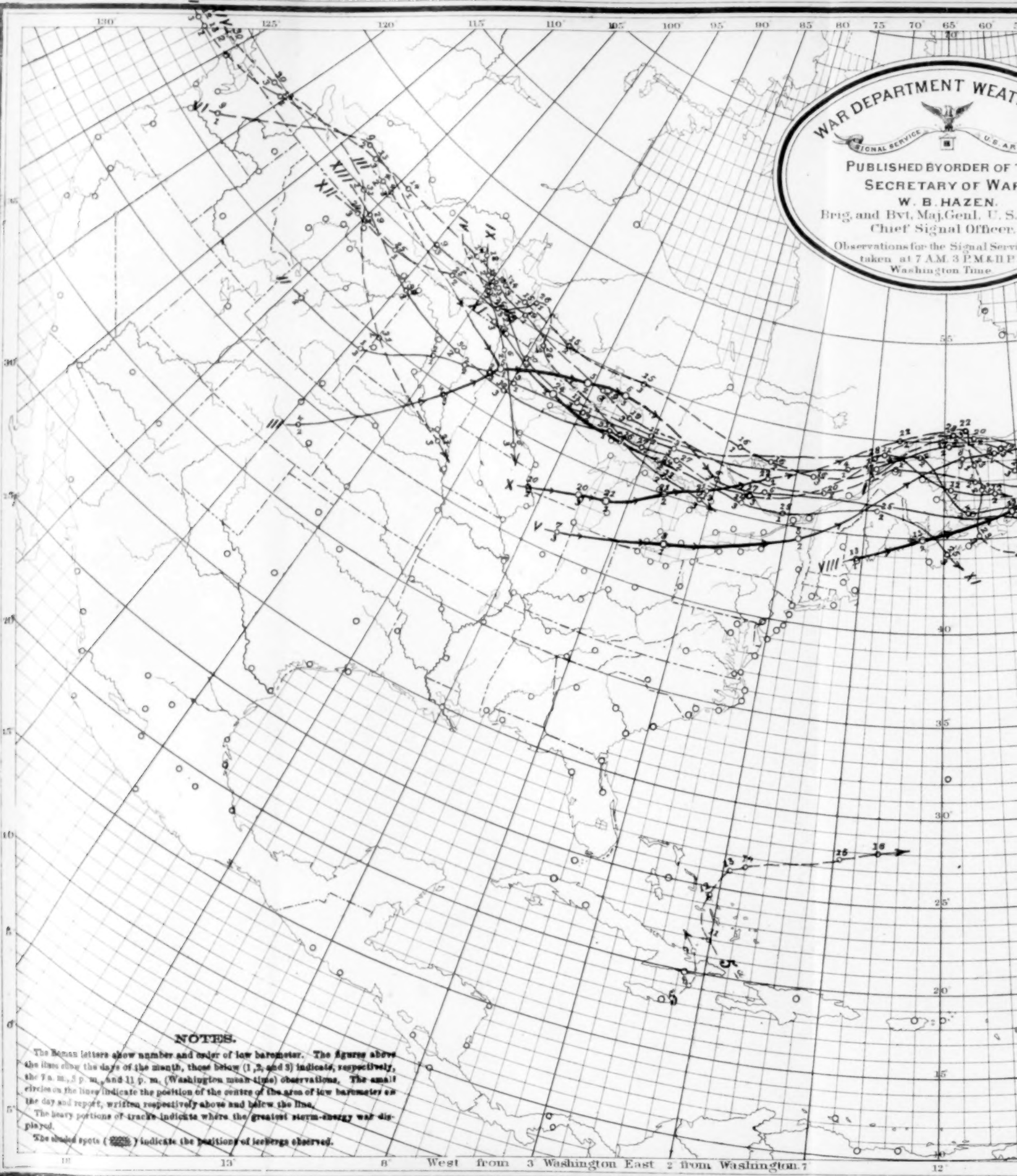
Thunderstorms occurred in many counties on the 4th, 5th, 7th, 16th, and 24th.

**Professor H. A. Huston, of Lafayette, Indiana, furnishes the following meteorological summary for the state:**

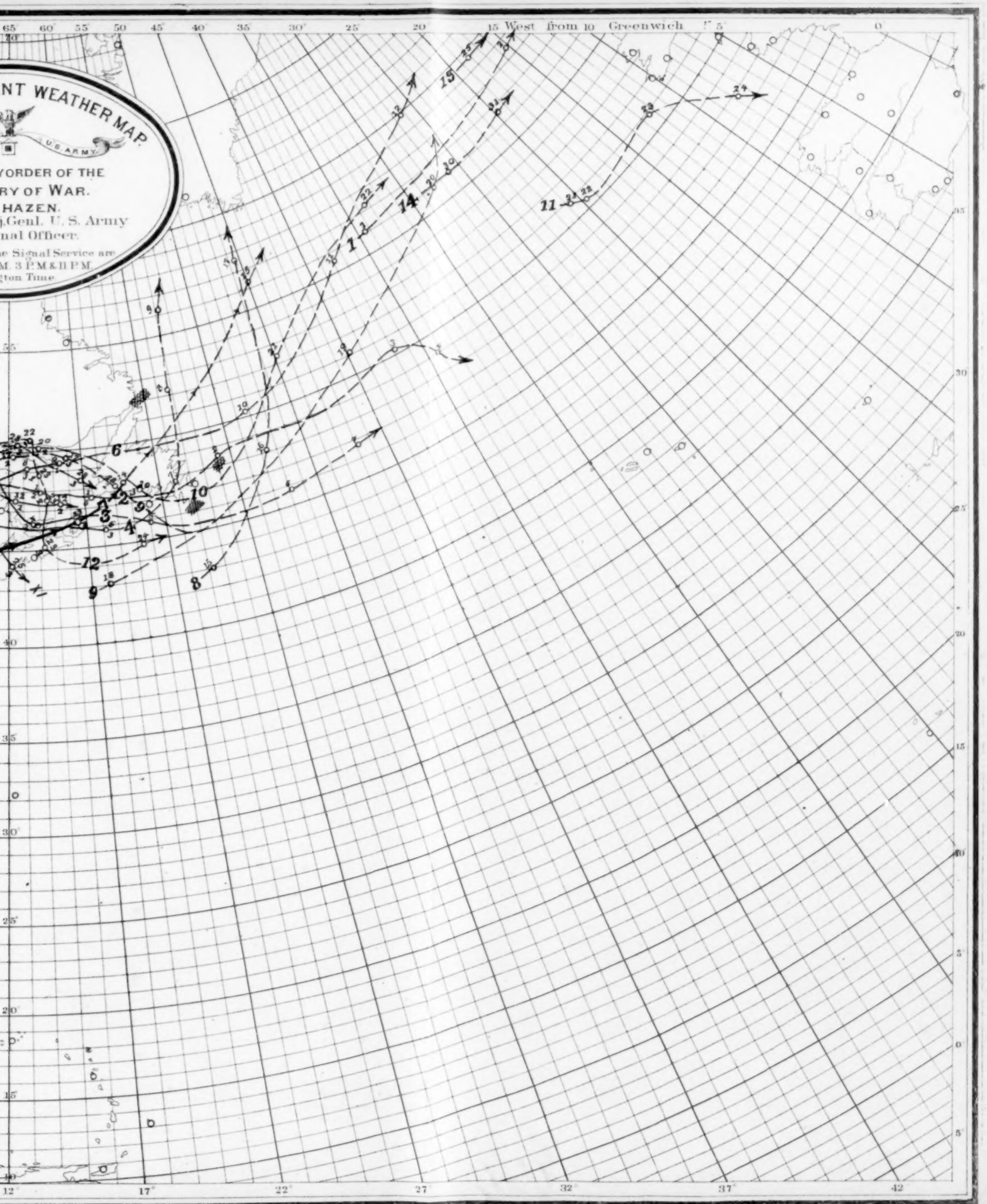
| Districts. | Temperature. | | | Average Rainfall. |
|---|---|---|---|---|
| | Highest. | Lowest. | Monthly mean. | |
| | ° | ° | ° | |
| Northern counties..... | 90 | 30 | 56.8 | 3.50 |
| Central counties..... | 91 | 24 | 56.2 | 2.08 |
| Southern counties..... | 96 | 24 | 60.0 | 2.16 |
| State..... | 96 | 24 | 57.3 | 2.58 |

Form 106 C 1884.

# Chart I. Tracks of Low-Barometer Ar


WAR DEPARTMENT WEAT
SIGNAL SERVICE
U.S. AR
PUBLISHED BY ORDER OF
SECRETARY OF WAR
W. B. HAZEN.
Brig. and Bvt. Maj. Genl. U. S.
Chief Signal Officer.
Observations for the Signal Servi
taken at 7 A.M. 3 P.M. & 11 P
Washington Time
NOTES.
The Roman letters show number and order of low barometer. The figures above the lines show the days of the month, those below (1, 2, and 3) indicate, respectively, the 7 a. m., 3 p. m., and 11 p. m. (Washington mean time) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.
The heavy portions of tracks indicate where the greatest storm-energy was displayed.
The shaded spots ( ) indicate the positions of icebergs observed.
West from 3 Washington East 2 from Washington. 7

eter Areas. October, 1884.


NT WEATHER MAP.
U.S. ARMY
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HAZEN.
Genl. U. S. Army
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M. 3 P.M & 11 P.M.
gton Time
West from 10 Greenwich
65 60 55 50 45 40 35 30 25 20 15 10 5 0
70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
12 17 22 27 32 37 42

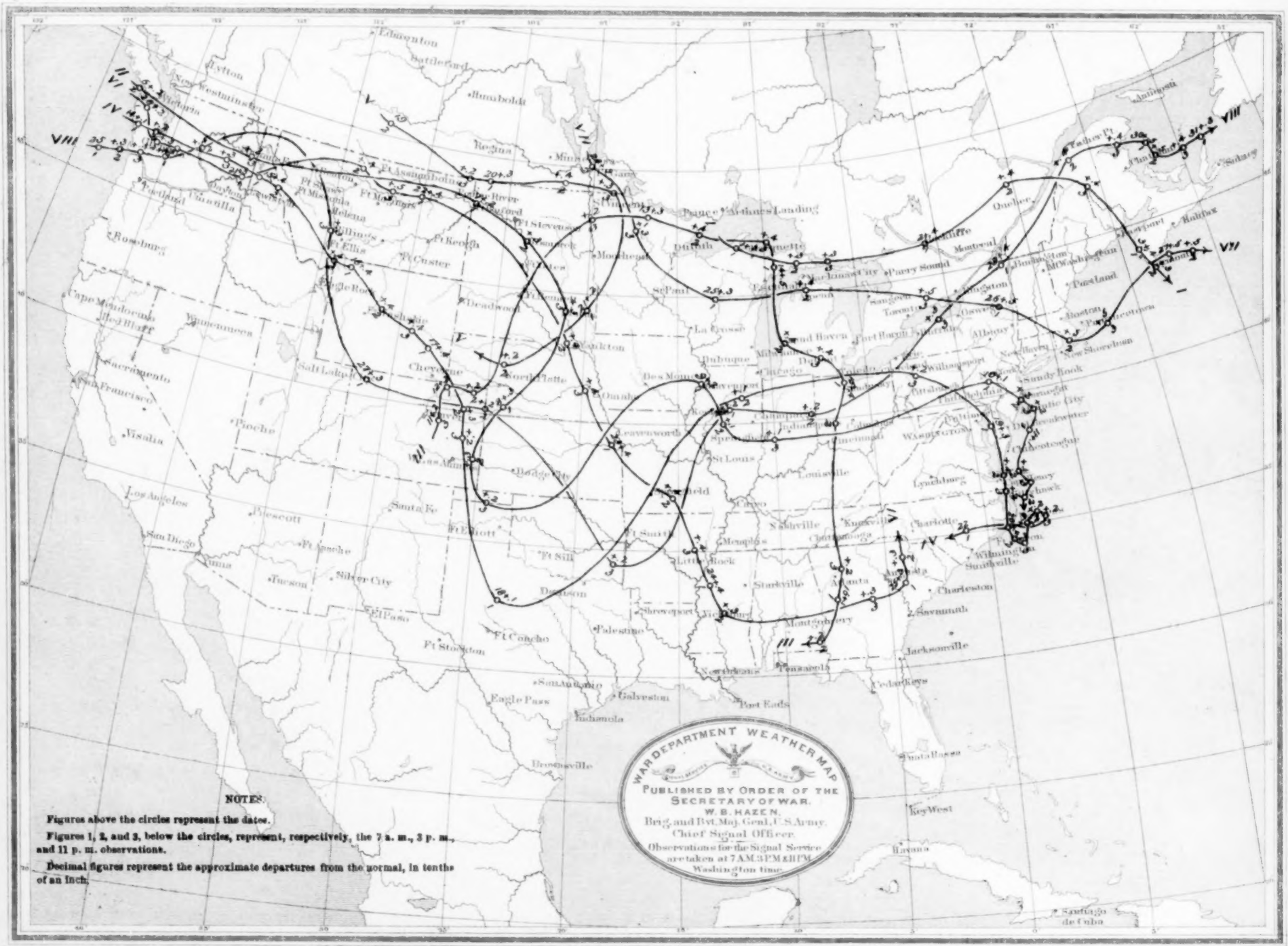
Signal Office Lith.

Chart I *a*. Tracks of Centres of High Barometer, or Anti-Cyclonic Areas, with their Departures from the Normal. October, 1884.

Form 896 P.

Form 106 F

# Chart I *a*. Tracks of Centres of High Barometer, or Anti-Cyclonic Areas, with their Departures from the Normal. October, 1884.


WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
W. B. HAZEN,
Brig. and Bvt. Maj. Genl. U. S. Army,
Chief Signal Officer.
Observations for the Signal Service are taken at 7 AM. 3 PM & 11 PM. Washington time.
NOTES.
Figures above the circles represent the dates.
Figures 1, 2, and 3, below the circles, represent, respectively, the 7 a. m., 3 p. m., and 11 p. m. observations.
Decimal figures represent the approximate departures from the normal, in tenths of an inch.

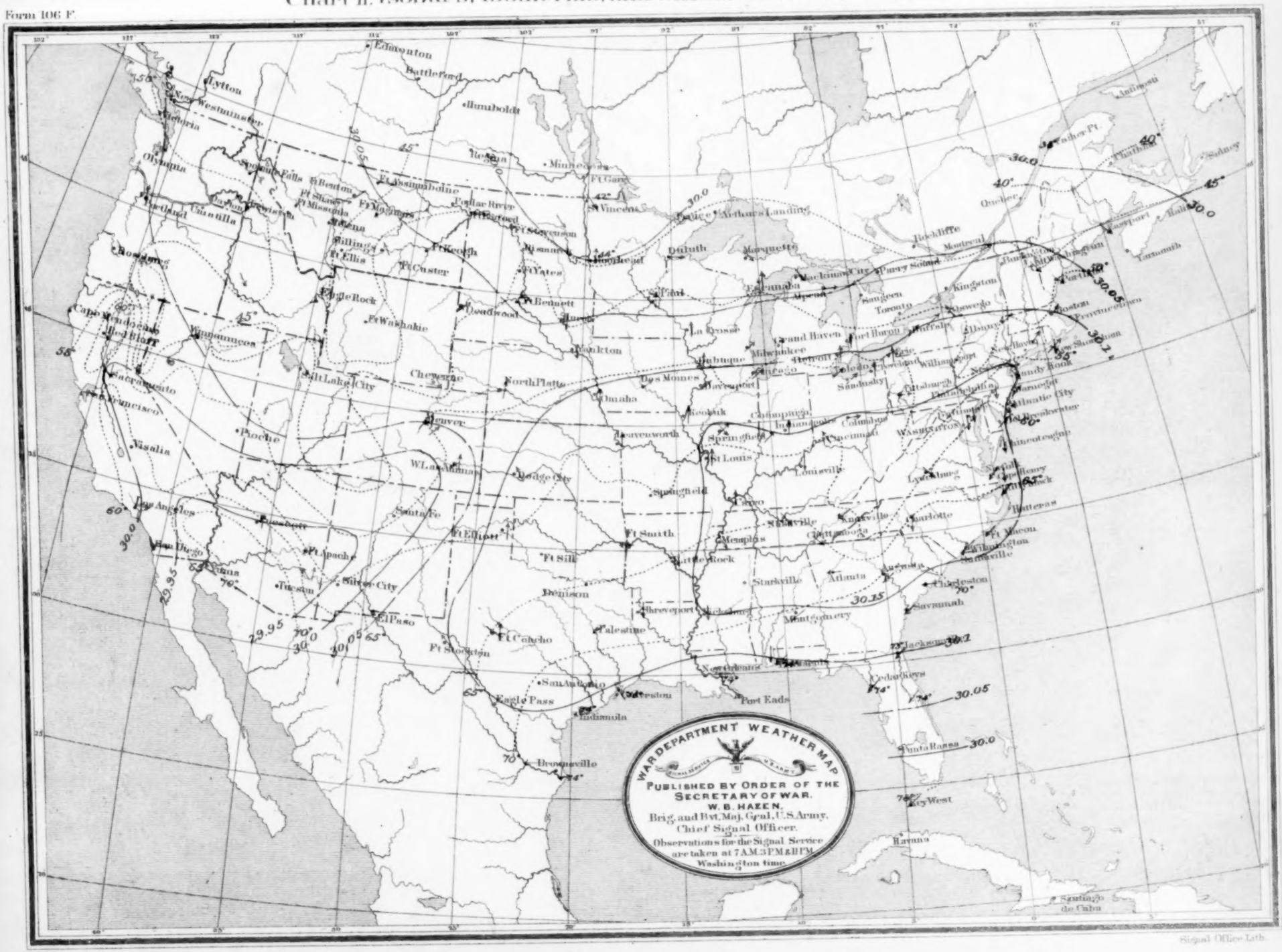
Signal Office lith.

Chart II. Isobars, Isotherms, and Winds. October; 1884.

Form 106 F.

Form 106 F.

# Chart II. Isobars, Isotherms, and Winds. October; 1884.




Signal Office Lith.

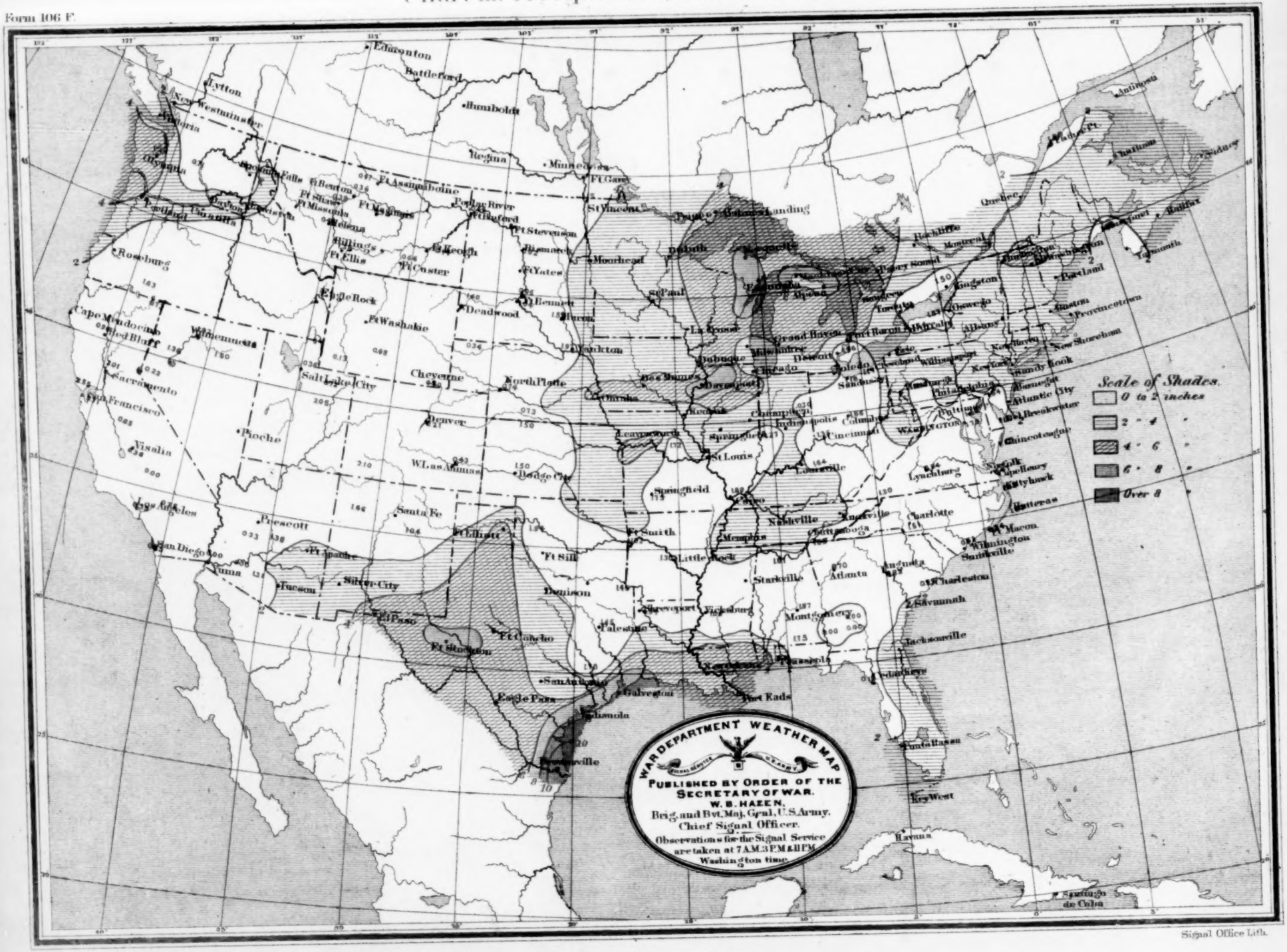
Chart III. Precipitation, October; 1884.



Form 106 F

# Chart III. Precipitation, October; 1884.

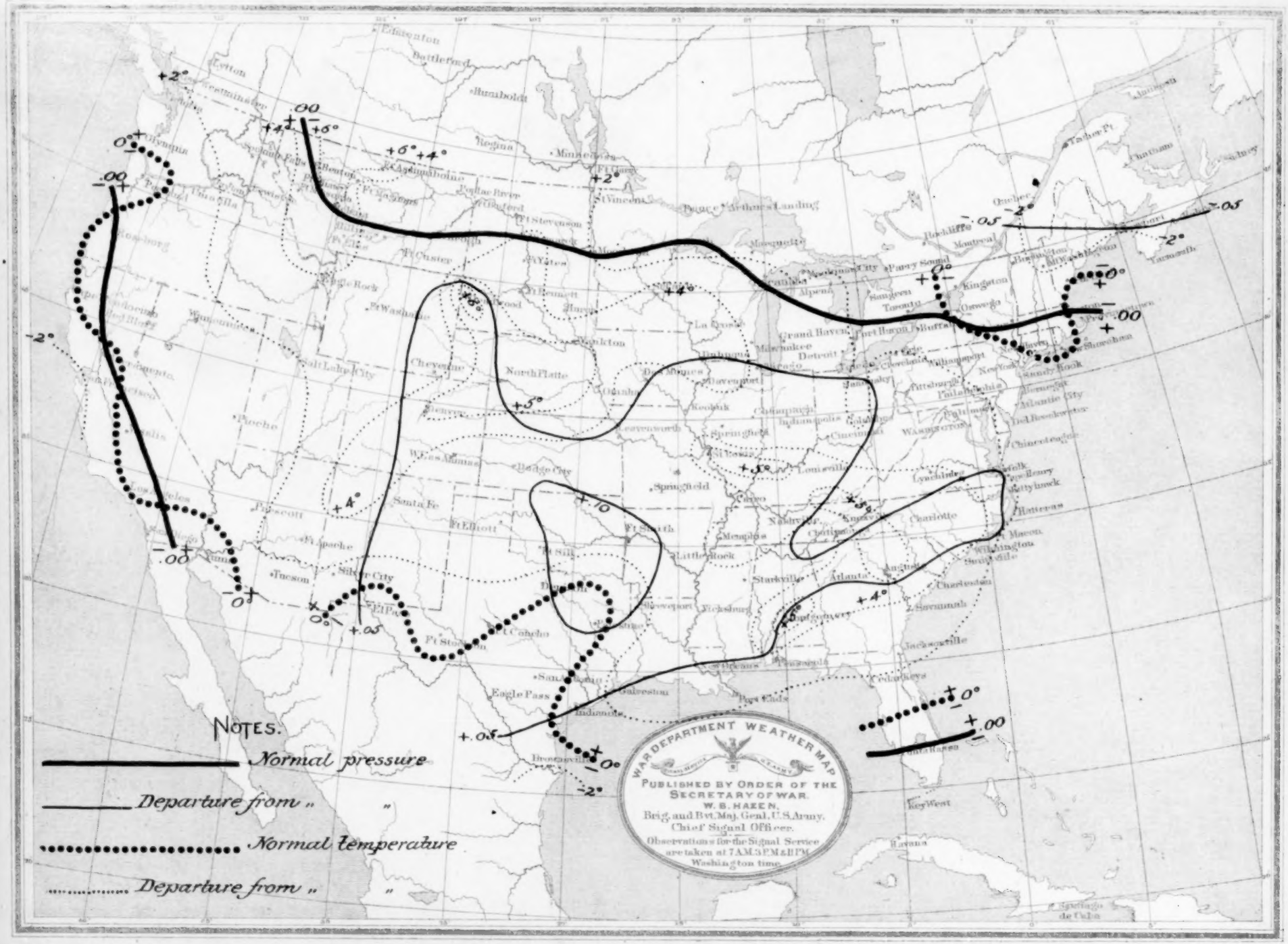
Form 106 F.


Scale of Shades.
0 to 2 inches
2 - 4 "
4 - 6 "
6 - 8 "
Over 8 "
WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
W. B. HAZEN,
Brig. and Bvt. Maj. Genl. U.S. Army,
Chief Signal Officer.
Observations for the Signal Service are taken at 7 A.M. 3 P.M. & 11 P.M. Washington time.

Signal Office Lith.

Chart IV. Departures from Normal Atmospheric Pressure and Temperature. October, 1884.

# Chart IV. Departures from Normal Atmospheric Pressure and Temperature. October, 1884.


NOTES.
Normal pressure
Departure from " "
Normal temperature
Departure from " "
WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
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Brig. and Bvt. Maj. Genl. U. S. Army,
Chief Signal Officer.
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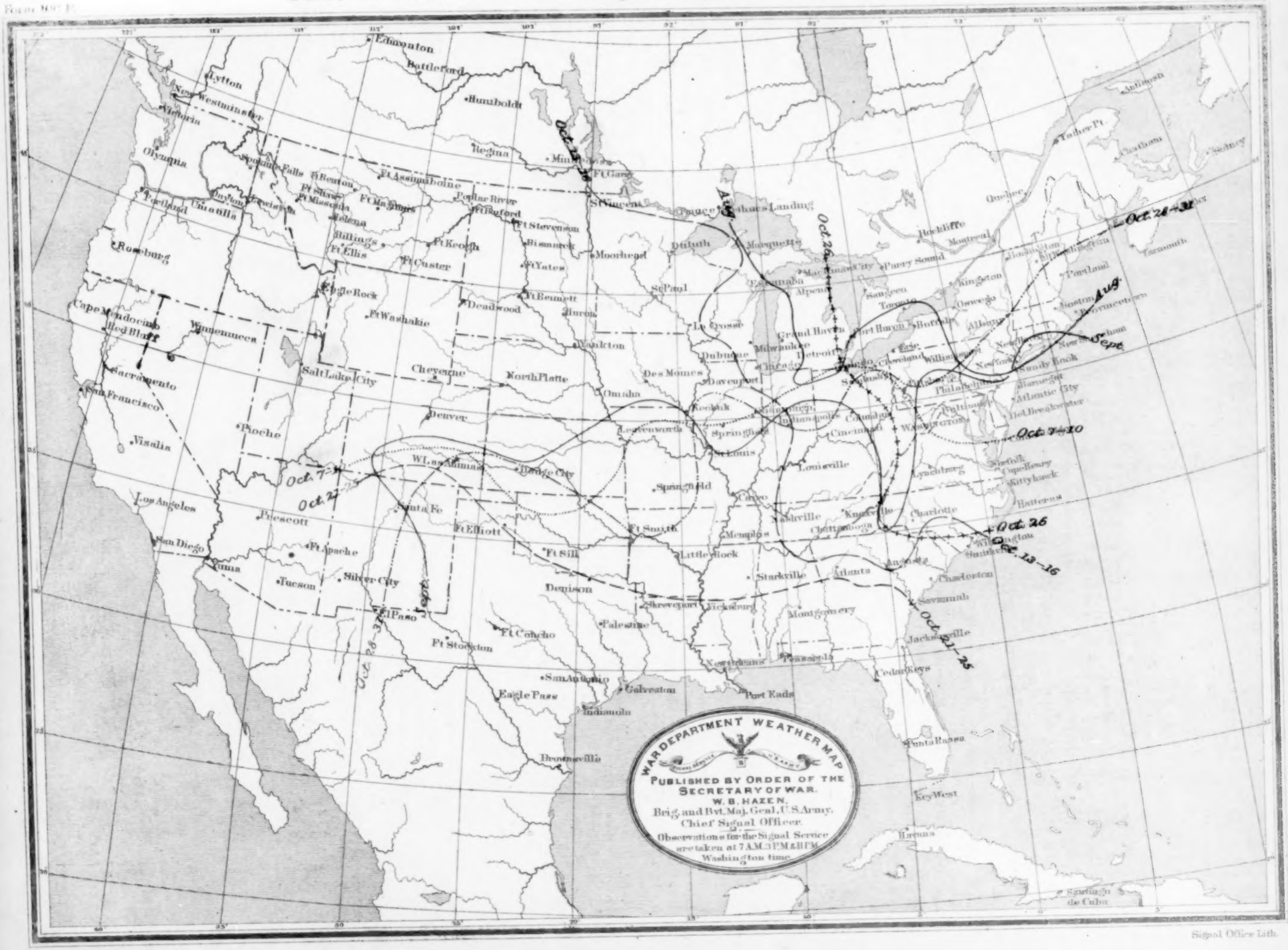
Signal Office Lith.

Chart V. Frost Limits for August, September, and October, 1884.

# Chart V. Frost Limits for August, September, and October, 1884.


WAR DEPARTMENT WEATHER MAP
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
W. B. HAZEN,
Brig. and Byt. Maj. Genl. U. S. Army,
Chief Signal Officer.
Observations for the Signal Service are taken at 7 A.M. 3 P.M. & 11 P.M. Washington time.
Aug.
Sept.
Oct. 7-10
Oct. 13-16
Oct. 21-25
Oct. 26
Oct. 21-31
Oct. 7
Oct. 22
Oct. 28-31
Edmonton
Battleford
Humboldt
Regina
Prince Albert
Duluth
Marquette
Montreal
Quebec
Toronto
Chicago
Detroit
Cleveland
Buffalo
Boston
New York
Philadelphia
Baltimore
Washington
Cincinnati
St Louis
Louisville
Memphis
Atlanta
Charleston
Savannah
Jacksonville
Cedar Keys
Key West
Havana
New Orleans
Galveston
San Antonio
Eagle Pass
Brownsville
Indianola
Port Eads
Denison
Shreveport
Vicksburg
Little Rock
Fort Smith
Fort Sill
Fort Elliott
Fort Concho
Fort Stockton
El Paso
Tucson
Silver City
Fort Apache
Prescott
Santa Fe
Los Angeles
San Diego
Yuma
Visalia
Sacramento
San Francisco
Cape Mendocino
Red Bluff
Roseburg
Portland
Olympia
Victoria
New Westminster
Lytton
Walla Walla
Spokane Falls
Fort Benton
Fort Assiniboine
Fort Maginnis
Fort Shaw
Fort Missoula
Helena
Billings
Fort Ellis
Fort Custer
Fort Keogh
Fort Yates
Fort Bennett
Fort Stevenson
Fort Buford
Poplar River
Bismarck
Moorhead
St Vincent
St Paul
Eagle Rock
Deadwood
Fort Washakie
Winnemucca
Salt Lake City
Cheyenne
North Platte
Denver
Dodge City
Omaha
Yankton
Huron
Des Moines
Davenport
Dubuque
La Crosse
Milwaukee
Grand Haven
Port Huron
Alpena
Parry Sound
Kingston
Oswego
Albany
Rockcliffe
Father Pt.
Chatham
Sydney
Tadoussac
Portland
Boston
Provincetown
Atlantic City
Delaware Breakwater
Hatteras
Kittyhawk
Currituck
Wilmington
Charlotte
Knoxville
Chattanooga
Nashville
Evansville
Springfield
Leavenworth
Wichita
Fort Elliott
Fort Apache
Fort Concho
Fort Stockton
Palestine
Monterey
Tampico
Santiago de Cuba
Bahama
Jupiter Inlet
Sandy Hook
Barnegat
Cape May
Lewes
Norfolk
Wytheville
Lynchburg
Pittsburg
Erie
Toledo
Columbus
Indianapolis
Springfield
Cairo
Memphis
Vicksburg
Natchez
Mobile
Pensacola
Tallahassee
Jacksonville
Fernandina
Charleston
Savannah
Augusta
Atlanta
Chattanooga
Knoxville
Asheville
Wytheville
Lynchburg
Richmond
Washington
Baltimore
Philadelphia
New York
Boston
Portland
Provincetown
Father Pt.
Tadoussac
Quebec
Montreal
Rockcliffe
Toronto
Kingston
Oswego
Albany
Buffalo
Erie
Cleveland
Detroit
Chicago
Milwaukee
Grand Haven
Port Huron
Alpena
Parry Sound
Sault Ste Marie
Marquette
Duluth
St Paul
La Crosse
Dubuque
Davenport
Des Moines
Omaha
Yankton
Huron
Deadwood
Fort Washakie
Cheyenne
North Platte
Denver
Dodge City
Fort Elliott
Fort Sill
Fort Smith
Little Rock